From the house of **Amar Chitra Katha** and **Tinkle**

BRAINWAVE™

SCIENCE IS JUST A GAME

Vol. 02 Issue 05
May 2013
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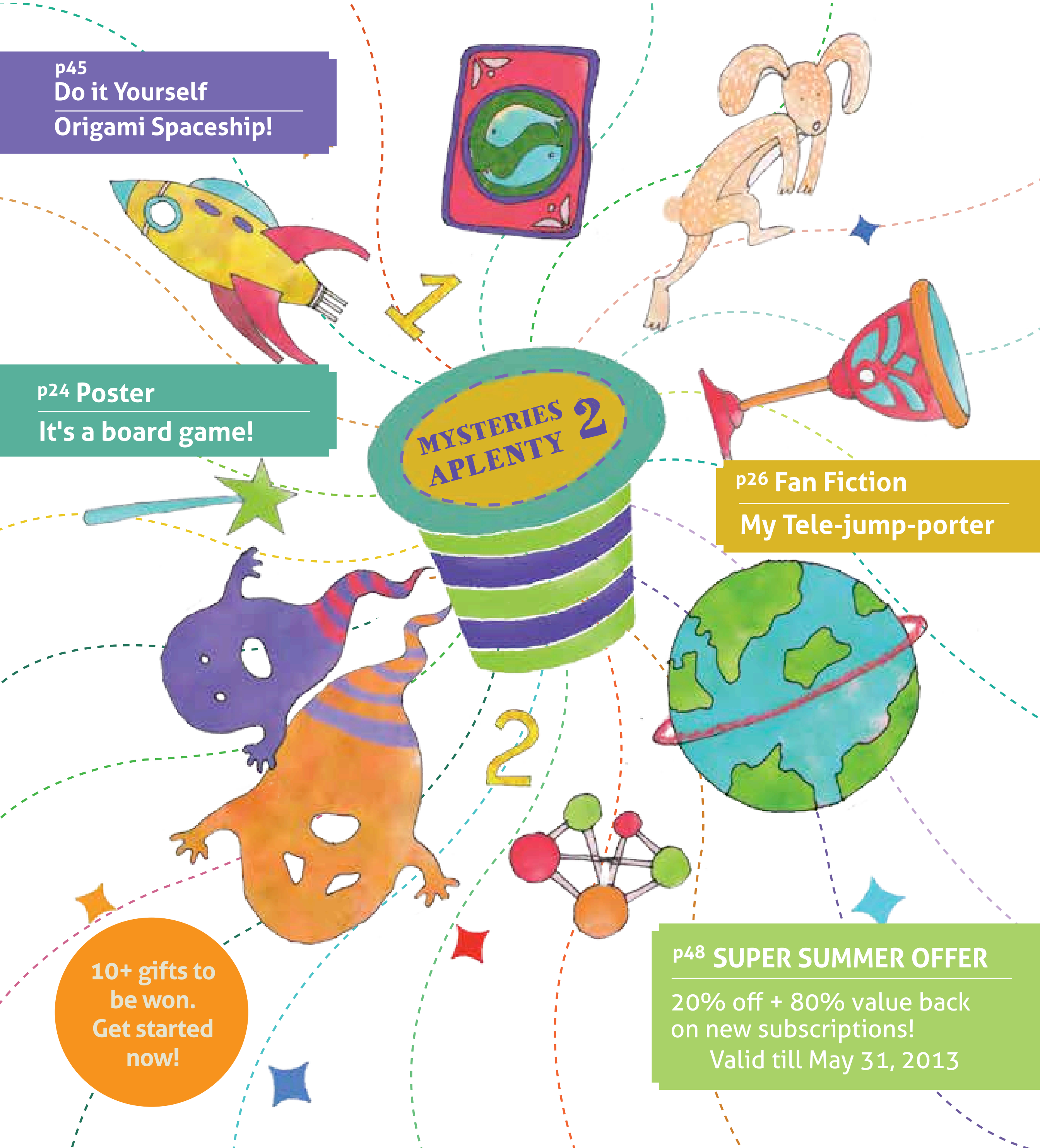

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Baby Steps

Dear Readers,

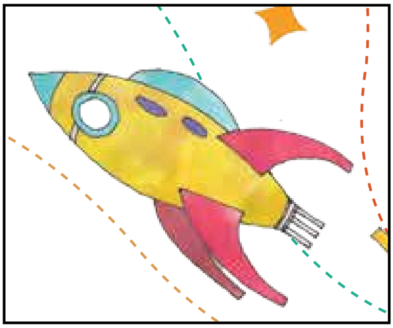
We humans have a long way to go with regard to our understanding of science. The reason is simple – while the Earth is 4 billion years old, we have been here for only 70,000 years.

When you draw parallels, we are babies and hence, we are yet to understand the complexities of the universe. When we do, we would have achieved a lot. Till then, there is always something new to learn.

I hope you are having a great summer vacation. Here's wishing you another great academic year ahead!

Scientifically,
JD, jayadev.calamur@ack-media.com

Cover artwork by **Saudamini Tambay**



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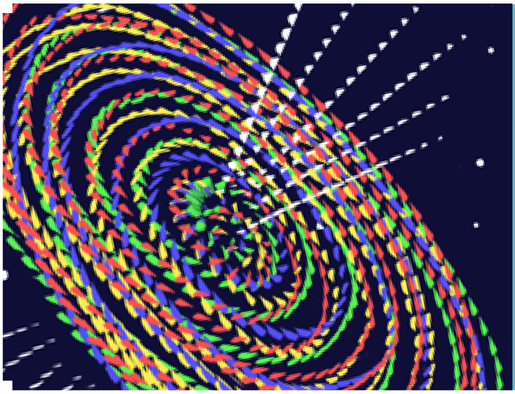

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★ Win a gift!

Bounce on!

Let's keep the momentum going. After all, it's not every day that you can make a toy like this!

by **Arvind Gupta & Kayomarz Bacha**

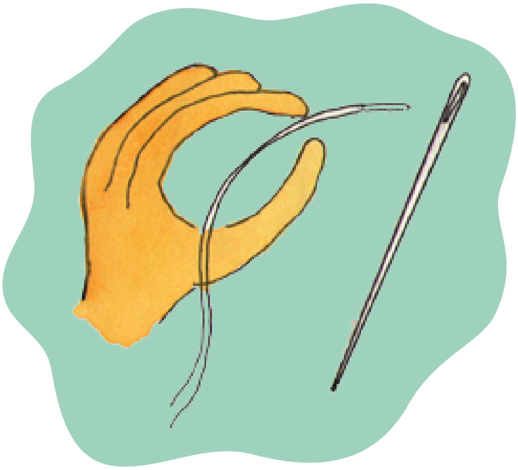
To do this, you need:

- 5-6 balls of different sizes and material, for instance plastic, rubber and cork
- A large needle (available at a fancy store or supermarket for Rs. 5)
- Thread

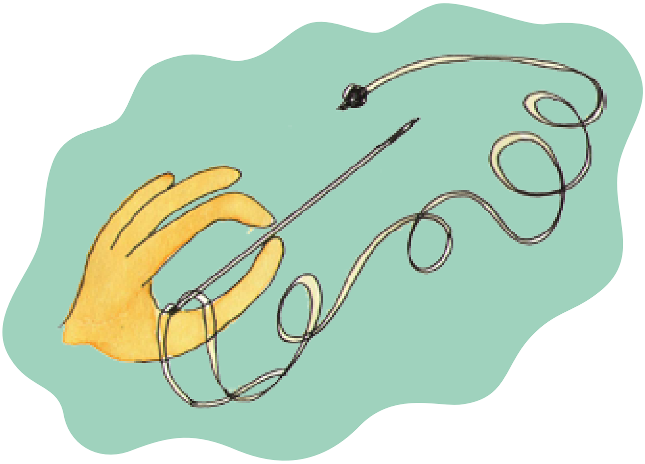
Note: Ensure that at least two balls are of equal size and weight.

METHOD:

Step 1
Weave the thread through the needle.



Step 2
Tie a knot joining the two ends of the thread so that it does not slip out from the needle's eye.

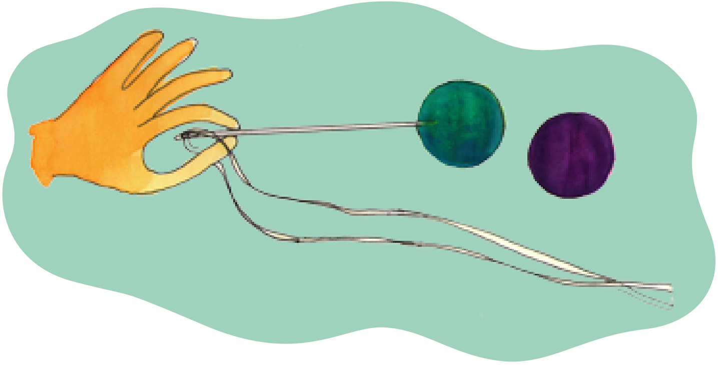


Artwork: Pooja Bhatt

View the video at: *www.youtube.com/watch?v=YOtOaVUDnB0*

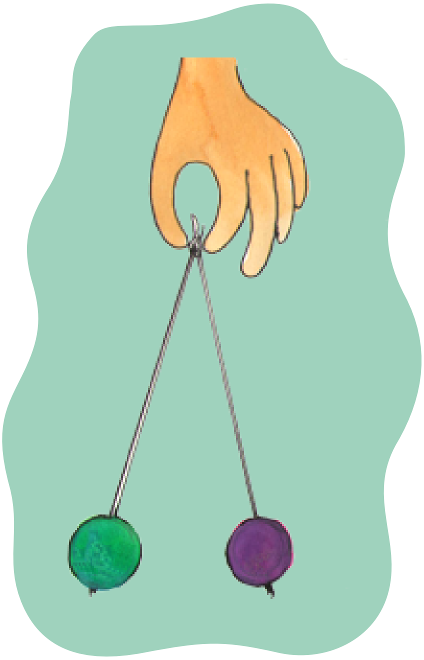
Step 3

Weave the thread through a ball, using the needle. Repeat the step using another ball of equal size and weight as the first.



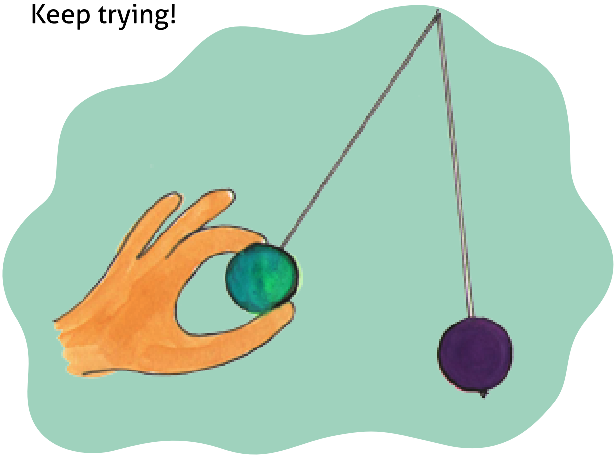
Step 4

Hold and hang the balls by their threads as shown in the figure. Ensure that the threads are of equal length.



Step 5

First, pull one of the balls to a side and release. Then, keep moving the wrist of the hand that is holding the threads of the balls up and down gently. You might not get it right the first time. Keep trying!



Try the experiment using balls of different sizes, materials and weights, and notice what happens. How far do the balls travel each time, as compared to those of the same size and weight? Which ball travels farther? How long do they continue bouncing?

What happens and why?

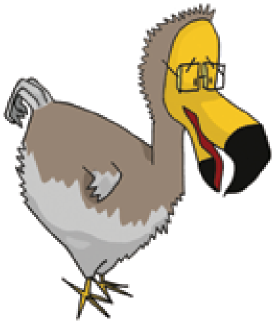
A momentum is created when the balls collide with each other. Momentum pushes the balls away from each other whereas gravity pulls them back towards each other.

In this experiment, since we have used two balls of equal sizes and weights, a continuous momentum is created. The balls move in opposite directions, to equal distances from the point of collision i.e. they bounce with the same amplitude. ■

……

What are momentum, amplitude, velocity and acceleration? Research and list out examples. Email the details to kayomarz.bacha@ack-media.com and you can win an ACK 3-in-one comic!

MEET THE SMARTIES

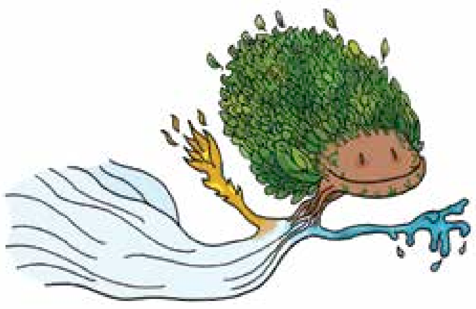


Dr. Dodo: Dr. Dodo is the co-founder of BW Labs and is the last living dodo. He holds a PhD in anachronomaly and parallel universes from the University of Clockwindistan. He invented the Galileo series of time machines.

Skree!: Skree! is the other founder of BW Labs. She loves dangerous experiments. She makes mini black holes before breakfast and has dark matter for lunch.

Arby: Arby is a genius who will grow up to be Aryabhata. He came to the future, thanks to Dr. Dodo's time machine. He is a fan of numbers, banana fritters and robot wars.

Mr. X: Mr. X, short for Xavier, was once Dr. Dodo's student. X is as brilliant as Alby and Arby, and by virtue of his knowledge of science, as powerful as Bhoo when the situation demands.



Bhoomi: Bhoomi, a.k.a. Bhoo, is an enigma. No one knows where she is from and how she came into being. She is made up of earth, wind, fire, and water in equal parts. Her alter-ego is Gaia Goel, a world famous science sleuth.

Alby: Alby will grow up to be Albert Einstein However, now, like Arby, he too has been sucked into the future. When he is not researching, he plays the violin.

Read more at www.bwmag.in/meet-the-smarties

Somewhere, Over The Rainbow

by **Sasikanth C**

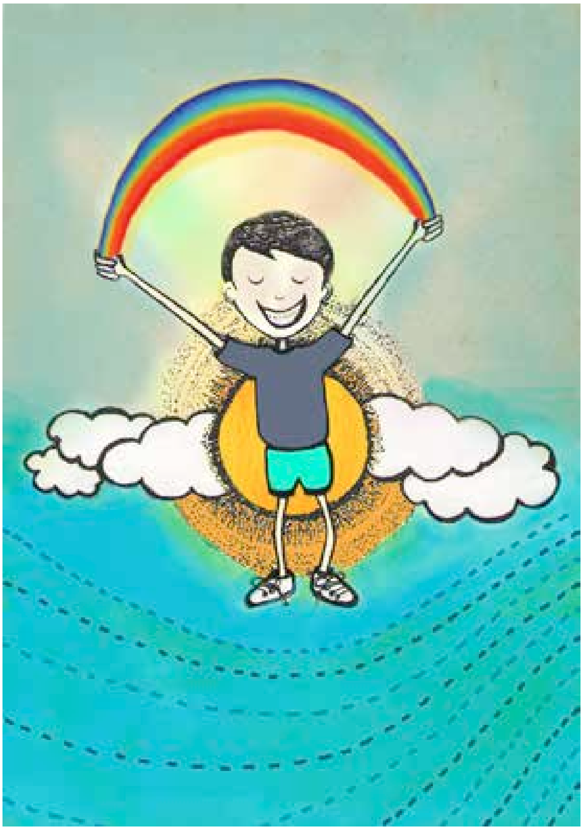
Revanth Kausikan asks, "Why are rainbows always shaped like an arch?"

Before answering this question, we need to understand how a rainbow is formed. A rainbow is formed when the Sun is behind and water droplets are in front of us. Light bends and disperses into various colours when it enters the water droplets due to refraction^G^. Some of this light hits the other side of the water droplets and gets reflected. The reflected light bends once more when it passes into the air and reaches our eyes.

We see rainbows as semicircles. In reality, they are circular in shape. We see them as semicircles because the Earth's horizon blocks the view. If we look out from an aeroplane, there would be nothing blocking our view and hence, we would observe that rainbows are circular in shape. The circular rainbow is positioned exactly opposite the Sun.

The angle between the light ray that enters a raindrop and the one that exits the raindrop is 40 degrees for blue light and 42 degrees for red. Many raindrops in the air form a rainbow. Some drops are at the right angle to reflect blue light and some send red light into our eye. Because light reaches our eyes from all directions at an angle, we see circular rainbows. We can think of this as a cone with its tip at our eye and the base at the rainbow.

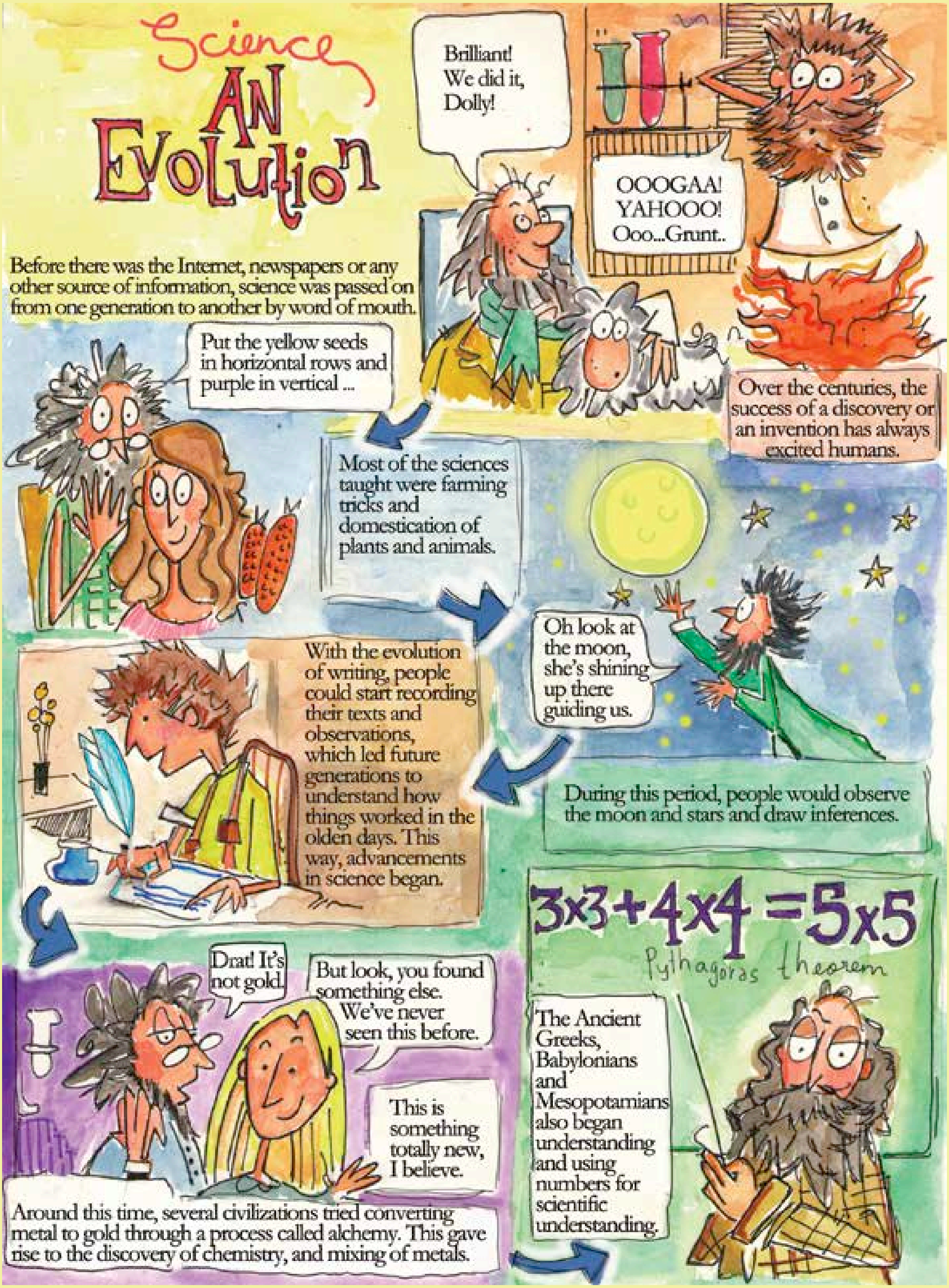
In the April 2013 issue of Brainwave, you must have read how you can make your own rainbow. Have you had a chance to try it out yet? If not, what are you waiting for? Take out the hosepipe from your garden, arm yourself with Brainwave and get going! ■



Artwork: Pooja Bhatt

Have a burning question? Email us at *brainwave@ack-media.com* with 'Ask Us Why' as the subject. The best question will win the latest Amar Chitra Katha animation CD!

Science AN Evolution


Brilliant! We did it, Dolly!
OOOGAA! YAHOOO! Ooo...Grunt..
Put the yellow seeds in horizontal rows and purple in vertical ...
Oh look at the moon, she's shining up there guiding us.
3x3+4x4 =5x5
Pythagoras theorem
Drat! It's not gold.
But look, you found something else. We've never seen this before.
This is something totally new, I believe.

Before there was the Internet, newspapers or any other source of information, science was passed on from one generation to another by word of mouth.

Over the centuries, the success of a discovery or an invention has always excited humans.

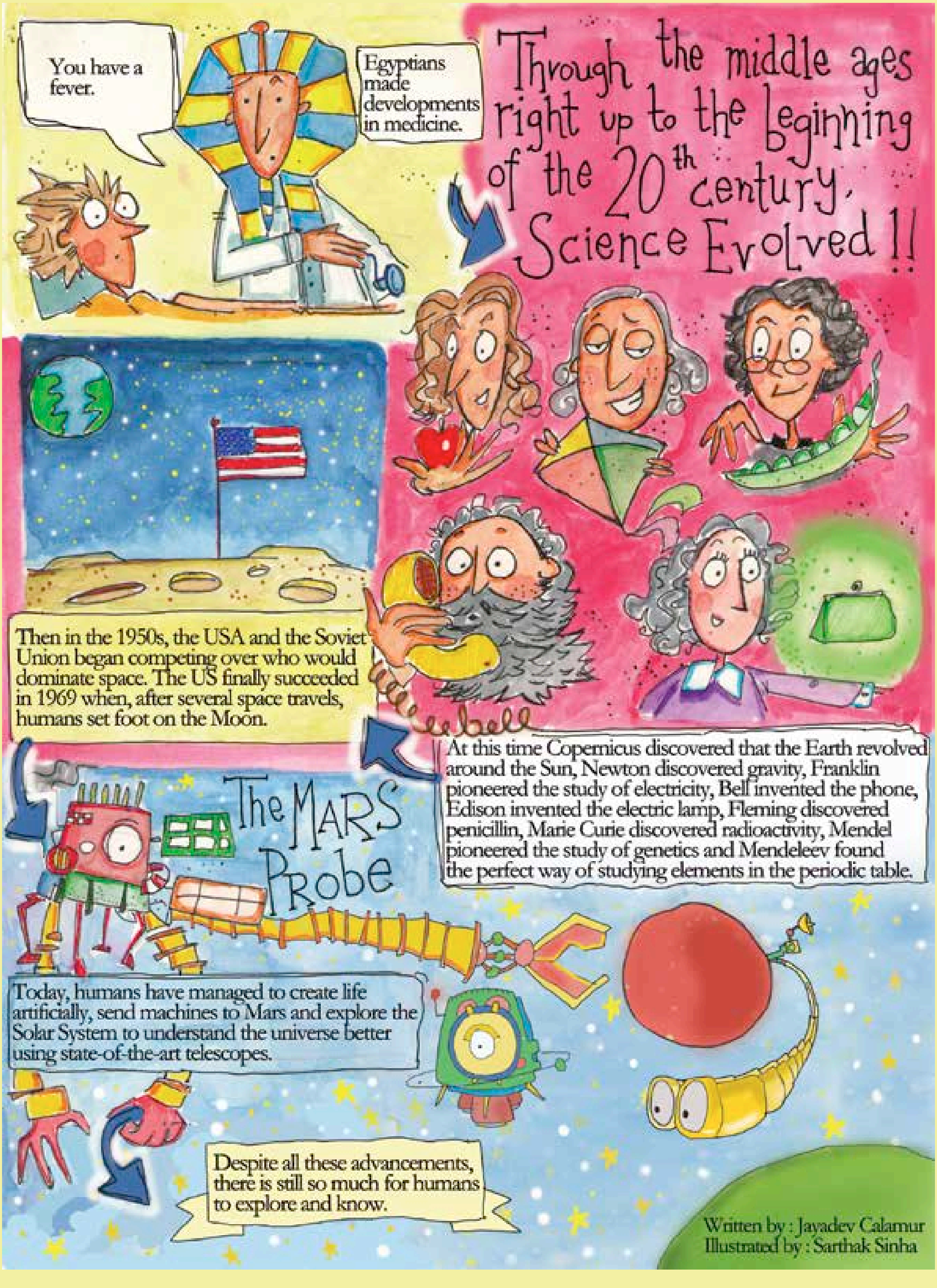
Most of the sciences taught were farming tricks and domestication of plants and animals.

During this period, people would observe the moon and stars and draw inferences.

With the evolution of writing, people could start recording their texts and observations, which led future generations to understand how things worked in the olden days. This way, advancements in science began.

Around this time, several civilizations tried converting metal to gold through a process called alchemy. This gave rise to the discovery of chemistry, and mixing of metals.

The Ancient Greeks, Babylonians and Mesopotamians also began understanding and using numbers for scientific understanding.



Egyptians made developments in medicine.

Through the middle ages right up to the beginning of the 20th century, Science Evolved !!

At this time Copernicus discovered that the Earth revolved around the Sun, Newton discovered gravity, Franklin pioneered the study of electricity, Bell invented the phone, Edison invented the electric lamp, Fleming discovered penicillin, Marie Curie discovered radioactivity, Mendel pioneered the study of genetics and Mendeleev found the perfect way of studying elements in the periodic table.

Then in the 1950s, the USA and the Soviet Union began competing over who would dominate space. The US finally succeeded in 1969 when, after several space travels, humans set foot on the Moon.

Today, humans have managed to create life artificially, send machines to Mars and explore the Solar System to understand the universe better using state-of-the-art telescopes.

Despite all these advancements, there is still so much for humans to explore and know.

Written by : Jayadev Calamur
Illustrated by : Sarthak Sinha

Be a Smartenstein!

We run more than ten activities and contests in each issue. They can win you many exciting prizes.

Participate in all the activites of an issue, and you can win a merit certificate, the title 'Smartenstein' and a mystery gift - every month!

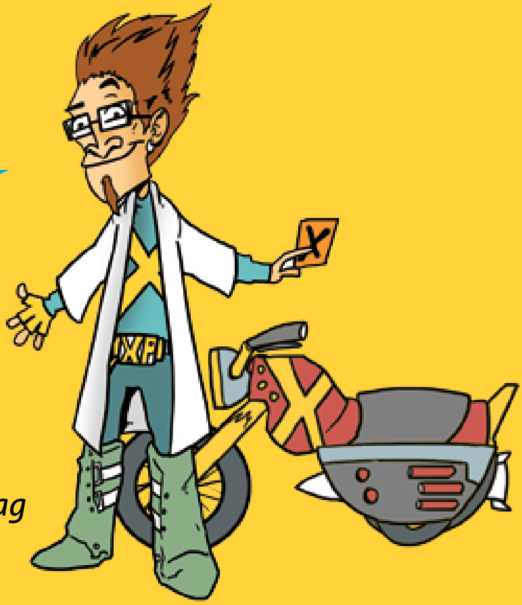
There are ten activities and contests in this issue: 'Toy Box **p4**', 'Ask us Why **p7**', 'Eye See **p21**', 'Third Law **p18**', 'Fan Fiction **p26**', 'Planet Ninjas **p36**', 'Magic Science **p36**', 'Fun-do Band **p27**', 'Super-teacher Awards **p27**' and 'Sci-Q Time **p47**'.

www.bwmag.in/category/bw-smartenstein

Artwork: Sarthak Sinha

Join us on our fun-do video channel as *Mr. X* performs some amazing experiments and *x-plains* the science behind them.

Mr. X will perform and publish your experiments too! Just email them to brainwave@ack-media.com



YouTube *www.youtube.com/Brainwavemag*

Artwork: Abhijeet Kini

SOLUTIONS AND WINNERS

Science Mysteries is the correct answer for the March 2013 issue *Treasure Hunt*. The winner is Ananya Grover. She wins a gift voucher worth Rs. 1000! Aarushi Joshi, Vijayatha V and Adityan Ganesh too got the answer right and deserve a special mention!

Winners of other activities are:
Third Law: Meenakshi Muthiah
Ask Us Why: Alok Deshpande
Eye See: Rekha Pattar and Sanket Patil
Fan Fiction: Prashant Kumar
DIY: Bharath Kumar
Planet Ninjas: Vishahini Nellai
Magic Science: Revanth Kausikan
Sci-Q Time: Ashwin Ujre
BW Smartenstein: Ananya Grover

Rekha and Sanket get nominated for the BW Student Board - *www.bwmag.in/student-board.*

The BW Smartenstein title and prizes for Feb 2013 go to Pratul Venkatesh. For more details, visit *www.bwmag.in/category/bw-smartenstein.*

All Fun-do Band captains - ensure that each of your team members visits and registers individually at *www.bwmag.in/fun-do-band.* Your team membership will be activated only after that. If they face any issues during the process, write to brainwave@ack-media.com

April 2013 winners will be declared in the June 2013 issue. Till then, keep participating and may you win loads of prizes!

Letters from Readers

I have just started reading Brainwave. It's an awesome magazine. The March 2013 issue 'Underwater World' was very informative. The experiments are simple, yet effective. I want to become a scientist when I grow up.
Aarushi Joshi, via email.

Dear Aarushi,
It is great to hear from you. Glad that you like the magazine. Try out the experiments regularly and write to us with specific feedback. Hope to interview you for the 'Expert Talk' section once you become a scientist!
JD, Editor.

I will share an experiment that I did for my science project in school and got full marks and became famous - potato battery. Just visit this link: www.youtube.com/watch?v=AK1Kg_j2oCo I used copper and nails. I connected 10 potatoes and it lit up! Cool, right?
Yash Jitendar, via email.

Dear Yash,
Indeed that is very cool! Do send us more such experiments. We will feature them on our YouTube channel.
JD, Editor.

As the February issue of Brainwave was released very soon on the news-stands, I missed the January issue. Could you please send a soft copy (whole issue) of it?
Sudheeksha Sudhakar, via email.

Dear Sudheeksha,
We have emailed you the issue. Hope you received and read it. We look forward to hearing from you. What do you like the most in the magazine? What do you think is missing or could be improved?
JD, Editor.

Happy holidays, everyone! Team Brainwave.

Source: Press release by *Fosters + Partners*

A Weekend Home on the Moon?

We always thought that there would be a day when people would start migrating to places on other planets and moons. But we did not expect it to happen so soon.

Fosters + Partners, a part of the consortium set up by the European Space Agency, have unveiled their plans to build bases on the Moon! What is even more interesting is that they claim to construct the building with lunar soil, thus addressing the challenges of transporting material from the Earth.

A lunar base to house four people, which can offer protection from meteorites, gamma radiation and high temperature fluctuations, has been designed. The base would be set up by having layers of lunar soil built up over a cylindrical inflatable dome by a robot-operated 3D shell.

Simulated lunar soil has been used to create a 1.5 tonne mockup and 3D printing tests have been undertaken on a smaller scale in a vacuum chamber to echo lunar conditions. ■

The Eternal Youth Gene's Here?

A lab; Image source: Wikimedia Commons

Researchers say that extensive research about the ageing process in mice may one day help develop treatment for age-related diseases in humans.

Biologists claim that they turned back the "molecular clock" in old mice by placing a 'longevity' gene into their blood stem cells. This gene helps aged blood stem cells[G] handle stress. Placing the gene in the blood stem cells of old mice increased the formation of new blood cells. This could regulate degeneration in mice. The study was published on January 31 in the journal *Cell Reports*.

Experts, however, note that results of animal research are not always replicated in humans. ■

Artwork: Sarthak Sinha

The Universe Chronicles

by **Priyanka Talreja** and **Sasikanth C**

We continue our adventure with the alien, the dragon and the Abominable Snowman across the universe.

When we last met them, Trillian, Snowy and Draco had boarded Trillian's spacecraft to explore the universe.

"Off we go!" said Trillian. "Now guys, behold the miracle! I'm activating the warp drive on the ship so that we can travel at speeds greater than light and explore more of the universe. But you should know that even then, we might be able to see only a fraction of what really exists!"

"What is a warp drive, Trillian?" asked Snowy.

"The speed of light is approximately 3,00,000 Km/s. At this speed, it takes 134 milliseconds to circle the Earth's equator, 1.3 seconds to reach the Moon and 8.3 minutes to reach the Sun. But even at this speed, it takes 25,000 earth years to reach the nearest galaxy, the Canis Major Dwarf Galaxy and 100,000 years to go across the Milky Way. This means that a human needs 250 lifetimes to reach the nearest galaxy! This is where warp drive helps. It enables faster than light travel," explained Trillian.

Warp drive is a hypothetical faster-than-light propulsion system used in many science fiction works to enable intergalactic travel in human lifespans. The most notable of these fiction works is the television-cum-film series Star Trek, which uses the concept of the warp drive extensively.

A spacecraft equipped with a warp drive may travel at apparent speeds greater than that of light by many orders of magnitude. The National Aeronautics and Space Administration (NASA) is said to be researching this. For the status of their research, visit: *www.nasa.gov/centers/glenn/technology/warp/warpstat_prt.htm*

And the ship took off in a flash.

"Eeeeeee!" screamed Snowy and Draco, the latter spewing some fire, which came out of his nostrils.

"Relax guys, the bumpy part is over, we are out of the Earth's atmosphere and now, officially in space. Look around you!" said Trillian.

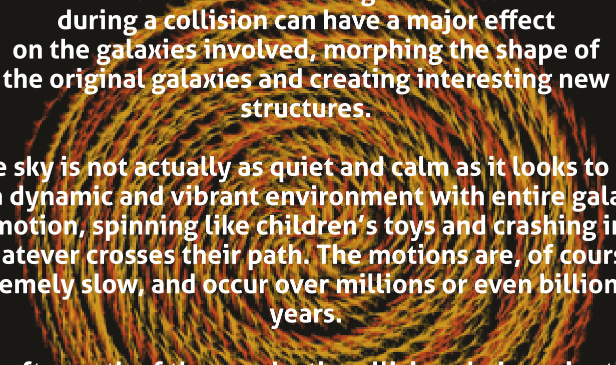
Draco and Snowy looked around and there it was, the beautiful universe. Vast and endless, it was ink black with white and yellow dots here and there, rocks floating in all directions, balls of colourful gases burning brilliantly and celestial bodies zooming by.

"Hey Trillian! What is that? The twisted worm-like structure," enquired Draco.

"What? Oh that! It is the charming and bright galaxy that the Earthlings have named *IRAS 23436+5257*. This galaxy has just been

discovered by NASA’s Hubble Space Telescope. Earthlings believe the twisted, worm-like structure of this galaxy is most likely the result of a collision and subsequent merger of two galaxies.”

“Oh wow! Trillian, how do these planets stay in orbit and not fall or fly off?” asked Snowy enthusiastically.



Such interactions are quite common in the Universe. Friction between the gas and dust during a collision can have a major effect on the galaxies involved, morphing the shape of the original galaxies and creating interesting new structures.

The sky is not actually as quiet and calm as it looks to us. It is a dynamic and vibrant environment with entire galaxies in motion, spinning like children’s toys and crashing into whatever crosses their path. The motions are, of course, extremely slow, and occur over millions or even billions of years.

The aftermath of these galactic collisions helps scientists understand how these movements occur and what may be in store for our own Milky Way, which is on a collision course with a neighbouring galaxy, Messier 31. The two galaxies are expected to collide in 3.75 billion years, eventually merging to form a giant elliptical galaxy.

Artwork: Sarthak Sinha

“The only logical answer that one can think of is that the gravity of the Sun keeps pulling these bodies together. The position of the planets and their respective velocities is such that there is a balance which keeps the planets in their orbits,” revealed Trillian.

As the spaceship cruised through the Universe, the trio marveled at the wonderful sights.

Trillian suddenly panicked and said, “Oh, oh, I better steer away quick. We might get close to a magnetar and get sucked in.”

“What’s a magnetar?” asked Draco and Snowy simultaneously.

“A magnetar, my friends is one of the most magnetic stars in the Universe. It has an ultra-powerful magnetic field and hence, a gravitational pull so powerful that a piece of bread impacting its surface would hit with the force of a thousand hydrogen bombs!” explained Trillian.

“In that case, I’m glad that you could figure out that we were approaching one and steer us away in time,” said Snowy.

“Oh look at that!” said Trillian. “That’s the Boötes Void, let’s go there.”

With a sharp turn, the spaceship headed into the void.

“Where are we Trillian? What is this? Can we please get out of here? This is scary!” pleaded Draco.

“Nothing to worry Draco, this is just a void. Voids are like holes in our Universe. They contain very few, or no, galaxies. The Boötes Void is the largest of them all, with a diameter of 250 million light years! The existence of voids is significant in providing physical evidence for dark energy," said Trillian.

For a while, the three of them just sat there, in a secure spaceship, staring out into another mystery of the Universe.

After some time, as Trillian turned the spaceship back to the Milky Way, she pointed towards something really red, bright and big. "Look at that, guys! That's VY Canis Majoris, one of the largest stars that we know of. This star is 2,000 times wider than the Sun. If an earthling would take the best racing car there is and tried to circle this star, it would take him 2,600 years to just complete a single round!" exclaimed Trillian. She was loving every minute of this journey, especially because her dear friends were with her.

As a cloud made up of gas and dust collapses in space, energy is released, heating it up. The centre of the cloud, called the prostar, gets hotter and hotter to about 10 million degrees or more until it ignites. This is how a new star is born.

Most of the gas in these clouds is hydrogen. At such high temperatures, the hydrogen atoms start to fuse together, producing enormous amounts of energy as light, heat and other radiation. When this happens, the collapsing cloud starts to shine as a star. It will continue to shine till it consumes all the hydrogen.

Before Draco and Snowy could respond, they whizzed by the big star and it disappeared out of sight. They craned their necks, but could only see so much.

Even before they settled down, Trillian shouted, "Look, look, a star has just taken birth. This is the first time I have seen this so closely. Boy, am I lucky!"

Snowy and Draco looked out of the window immediately, afraid that they would miss this sight too.

The three of them continued staring at the new-born star in a trance-like state when suddenly, an alarm on the spaceship set off, loud.

"Uh...ohh, time to go home! Or else I will be late for my alumni meet at the United Planets University for Intergalactic Relations," declared Trillian.

"What? No! We just came. We haven't seen much yet!" blurted out Draco and Snowy.

"I agree. The Universe is so vast, mysterious and fascinating that even a million lifetimes aren't enough to explore it. But it is already dawn on the Earth. And Draco, you are yet to find a new home," reminded Trillian.

Both Snowy and Draco had completely forgotten about their life and responsibilities back home. Reluctantly, they agreed to return.

"But we will do this again, right?" they asked, eyes filled with hope. What they had seen was yet to sink in. It gave them a new perspective of life. They had never seen or felt something that was so wonderful. It was almost close to spirituality. They already longed for more of it.

"Of course! And this time, I won't wait for a few millennia to pass!" promised Trillian.

At this, all of them had a hearty laugh and the space ship plunged back, towards Earth, and disappeared into the darkness of the Universe. ■

FOOD FOR THOUGHT

by **Priyanka Talreja**

How vast our universe is, can we tell now?
How was it created, do we really know?

What's in a black hole? Do aliens really
exist?
What lies at the bottom of the oceans?
Are mermaids just myths?

Why have we always felt the need of soothsayers?
Are they indeed gifted enough to see the future?

Our brain is so small, yet keeps us active and ready to run.
It makes up for just 2% of weight, but uses 20% of our
body's oxygen!

Dreams you might ask, 'what are those?'
All we can say is, "We don't still know!"

Now, let's hop back in time and take a look
at our ancestors,
'Primitive men' as they were called have
baffled all researchers.

Artwork: Sarthak Sinha

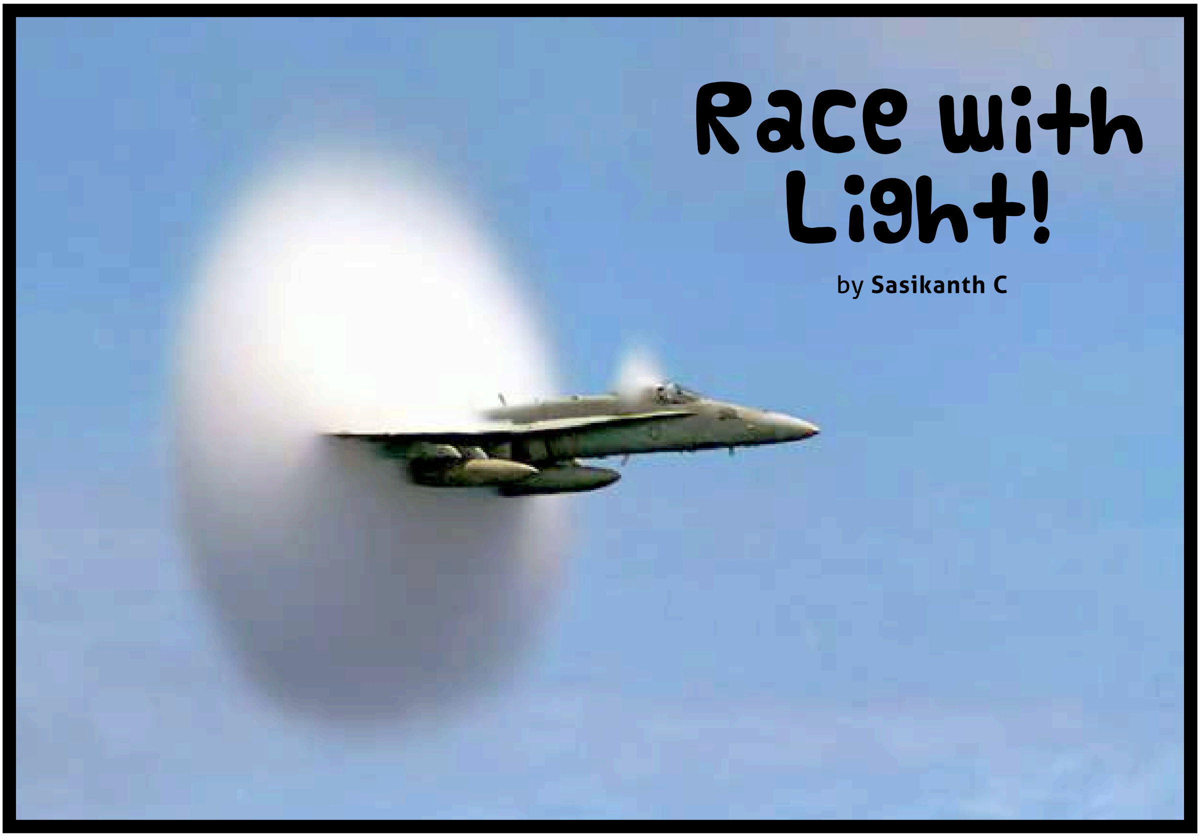
If they were indeed primitive, how did they
build the pyramids?
With no machines or any kind of technology,
they made such fabulous structures!

Mysteries there are many that are yet to be
solved,
Our body, the space and the underwater
world!

There is so much to dig into, so much to know,
Science is so vast, on a journey with
Brainwave, we go! ■

Race with Light!

by **Sasikanth C**



FA-18 Hornet breaking the sound barrier; Image source: Wikimedia Commons

Humans have fancied travelling at the speed of light ever since Albert Einstein proposed that nothing can travel faster than light, the speed of which is 300,000 km per second! Academicians at the University of Adelaide have even developed equations to explain how motion might operate in such cases.

So far, however, no one has been able to explain how such speeds could be achieved. In 2011, scientists at CERN[G], the European centre for particle physics[G] in Switzerland, declared that neutrinos[G] could be accelerated to these speeds. For a brief period, the whole world was excited - until CERN reported that their equipment set-up had flaws and hence, the observations were wrong!

While humans haven't been able to achieve faster-than-light speeds, they have been able to break travel at speeds faster than that of sound, which, in dry air at 20 °C, is about one kilometer in three seconds.

Today, we have fighter aircrafts that break the sound barrier. There have also been supersonic passenger aircrafts, the Concorde and the Tupolev Tu-144. Most modern firearm bullets are also supersonic. Recently, Austrian skydiver Felix Baumgartner jumped from 24 miles above the Earth and broke the sound barrier. He wore a special suit to protect himself from the near vacuum and heart-stopping speeds.

Let us, for now, hope that humans can invent ways to travel at speeds faster than that of light and applaud them for being able to travel at the speed of sound! ■

A Holy Story

by **Sarthak Sinha**

You must have watched the action-adventure movie, Indiana Jones and the Last Crusade. Made in 1990, the movie is about an archeologist and his search for the Holy Grail, the cup that Jesus Christ supposedly drank from during the Last Supper.

Interestingly, there are theories in real life that talk about the Holy Grail. Some of these originate from the Celtic culture, which speaks of a cauldron with special powers of immortality and eternal life.

Though belief in the Grail's existence and interest in its whereabouts has never ceased, no proof that the Grail actually exists has been found till date. Like mermaids, dragons and other mythical creatures, the Holy Grail is probably something that can only be explained when our knowledge of science expands. ■

Youth Erupts

by **Pooja Bhatt**

The Fountain of Youth is a legendary spring through which magic water erupts. People say that if one drinks or bathes in this water, the person would attain eternal youth and in some cases, even immortality.

The legend of the Fountain of Youth became well-known when the Spanish explorer and the first governor of Puerto Rico, Juan Ponce de Leon, went looking for it in the 16th century. His hunt for the Fountain led to the discovery of what is now the state of Florida in the United States.

There have been several attempts to search for the Fountain of Youth and it has been discussed widely in popular culture, but till date, it has not been discovered.

Meanwhile, scientists demonstrate that positive thinking is a far better remedy than foolish journeys to Florida for legendary cures. ■

Artwork: Kashmira Sarode

Golden Years

Alchemy has been a topic of discussion for centuries. But, what is alchemy really? Is it just converting base metals into gold? Read on and find out.

by **Sasikanth C**

The defining goal of alchemy is often said to be converting base metals into gold. However, this is just one aspect of alchemy. It also attempts to create an 'elixir of life' that confers youth and longevity, and to discover a universal solvent that has invaluable medicinal qualities.

Alchemy differs from modern science due to its inclusion of principles and practices related to mythology, religion and spirituality. It is said to be the art of achieving perfection which, for metals is gold, and for humans is longevity, then immortality and finally, redemption. Conversion of lead into gold is thought of as an analogy for purification and perfection.

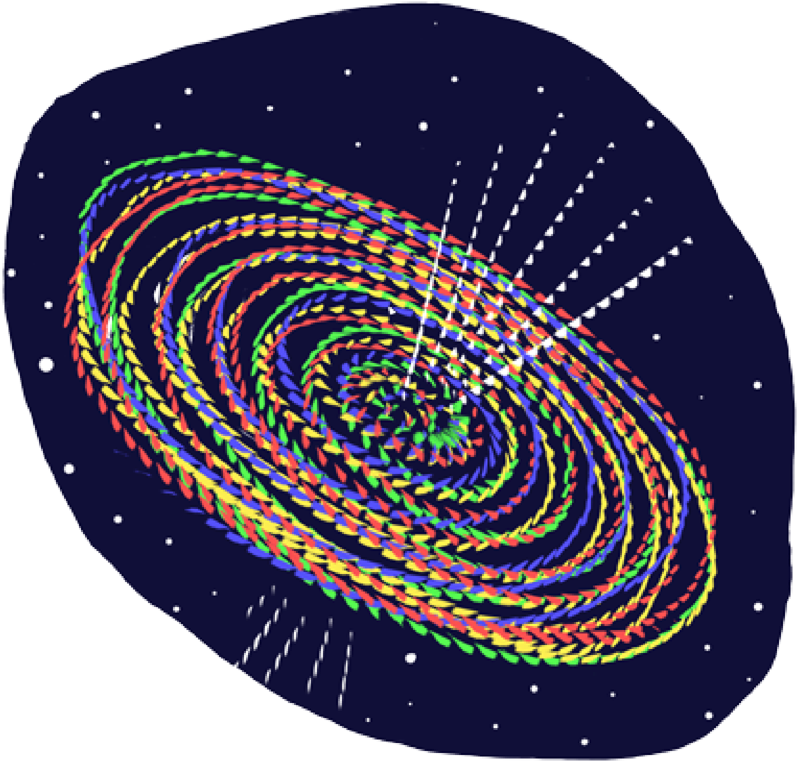
Practical applications of alchemy produced a wide range of contributions to modern chemistry — ore testing and refining, distillation, metalworking, gunpowder, ink, dyes, paints, cosmetics, leather tanning, ceramics, glass manufacturing and so on. The attempts of alchemists to arrange information on substances in such a way that the products of the chemical reactions could be clarified and anticipated, resulted in the creation of the first primitive periodic table.

But, by the 18th century, alchemy disappeared in favour of chemistry because chemistry provided a more reliable and scientific framework. This left the science of alchemy remain as mysterious as it has always been. ■

Artwork: Sarthak Sinha

A Space Shortcut

by **Kayomarz Bacha**



Imagine travelling from the Earth to another galaxy. Travelling by normal means will take centuries and perhaps some millennia to reach the destination. Think about it: our galaxy, the Milky Way, is just one amongst the few billion galaxies in space!

This is where wormholes help. A wormhole is a time-space shortcut that allows us to travel great distances in space in a much shorter span of time, sometimes instantaneously. It acts like a tunnel that directly connects two points that are otherwise light years away from each other.

As an analogy, imagine running around a mountain at maximum speed to the opposite side as compared to walking through a tunnel that runs through it! Which do you think will be faster?

Though there is no observational evidence of wormholes, theoretically, they can exist.

Theory also tells us that if wormholes exist, they could allow faster-than-light travel and time travel. This means that intergalactic and even interuniversal travel are possible within the span of an average human life! ■

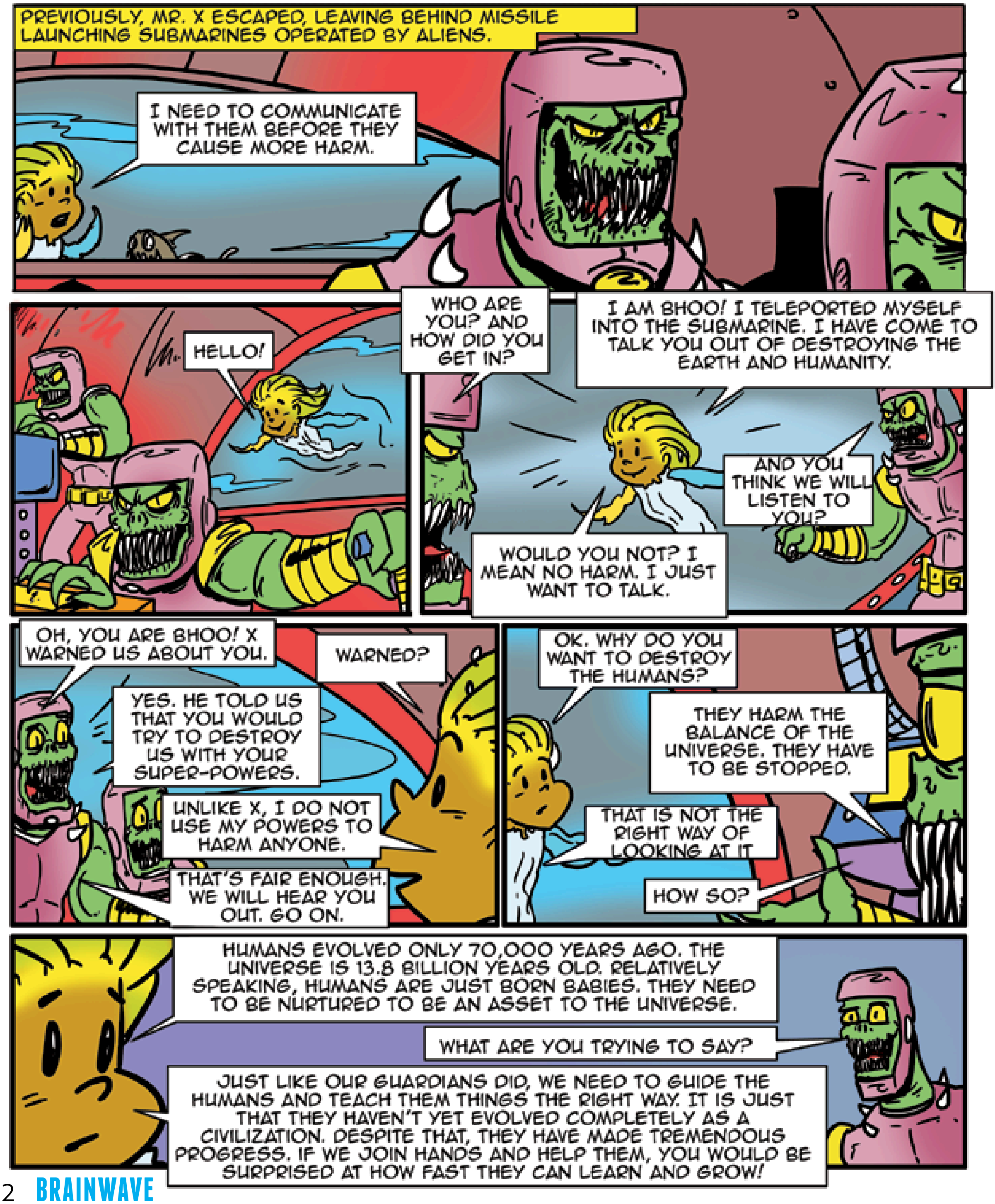
Artwork: Kashmira Sarode

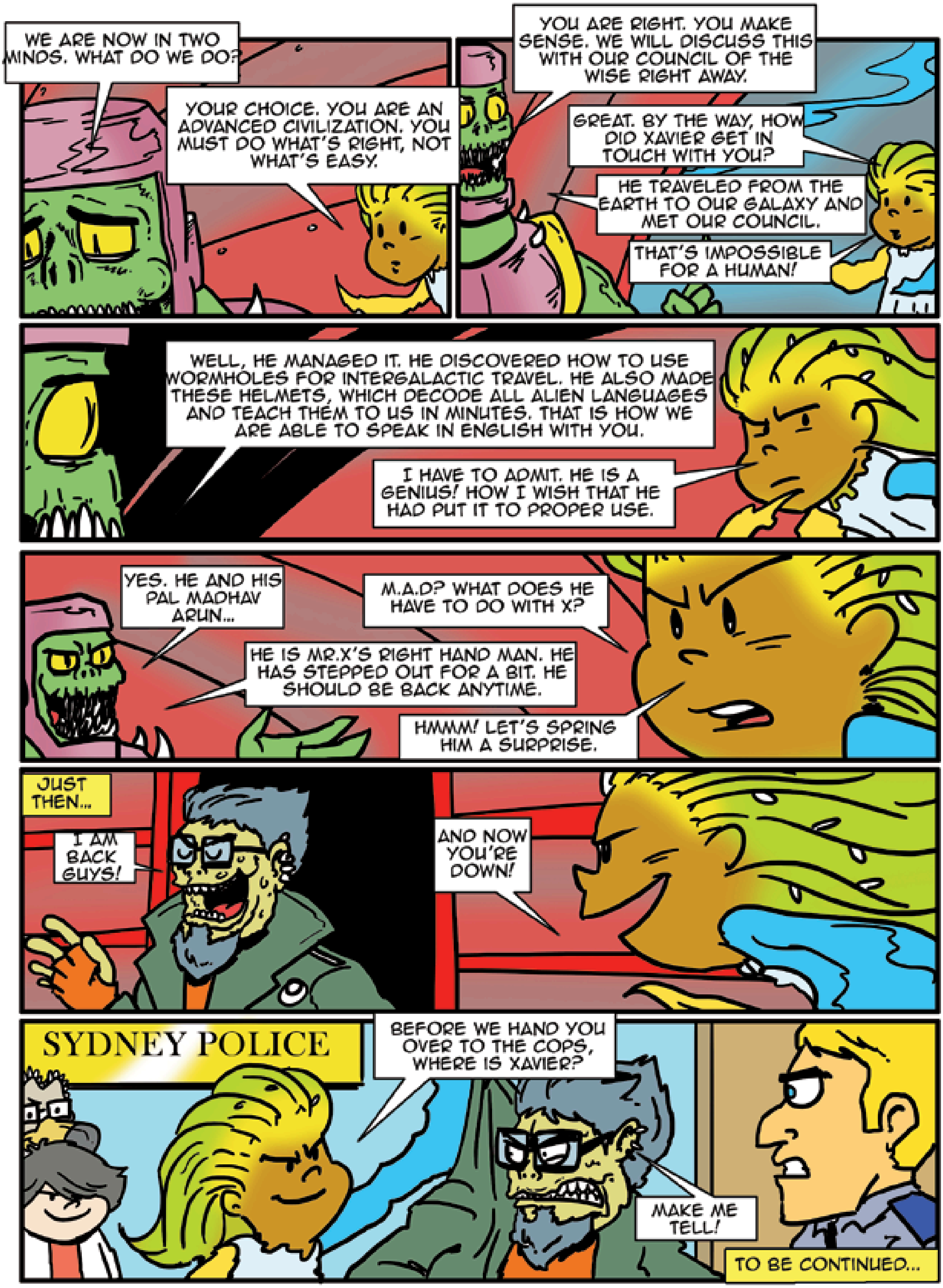
What are white holes? Find out and email to brainwave@ack-media.com
The most comprehensive and original entry will win you a nomination for the BW Student Board!

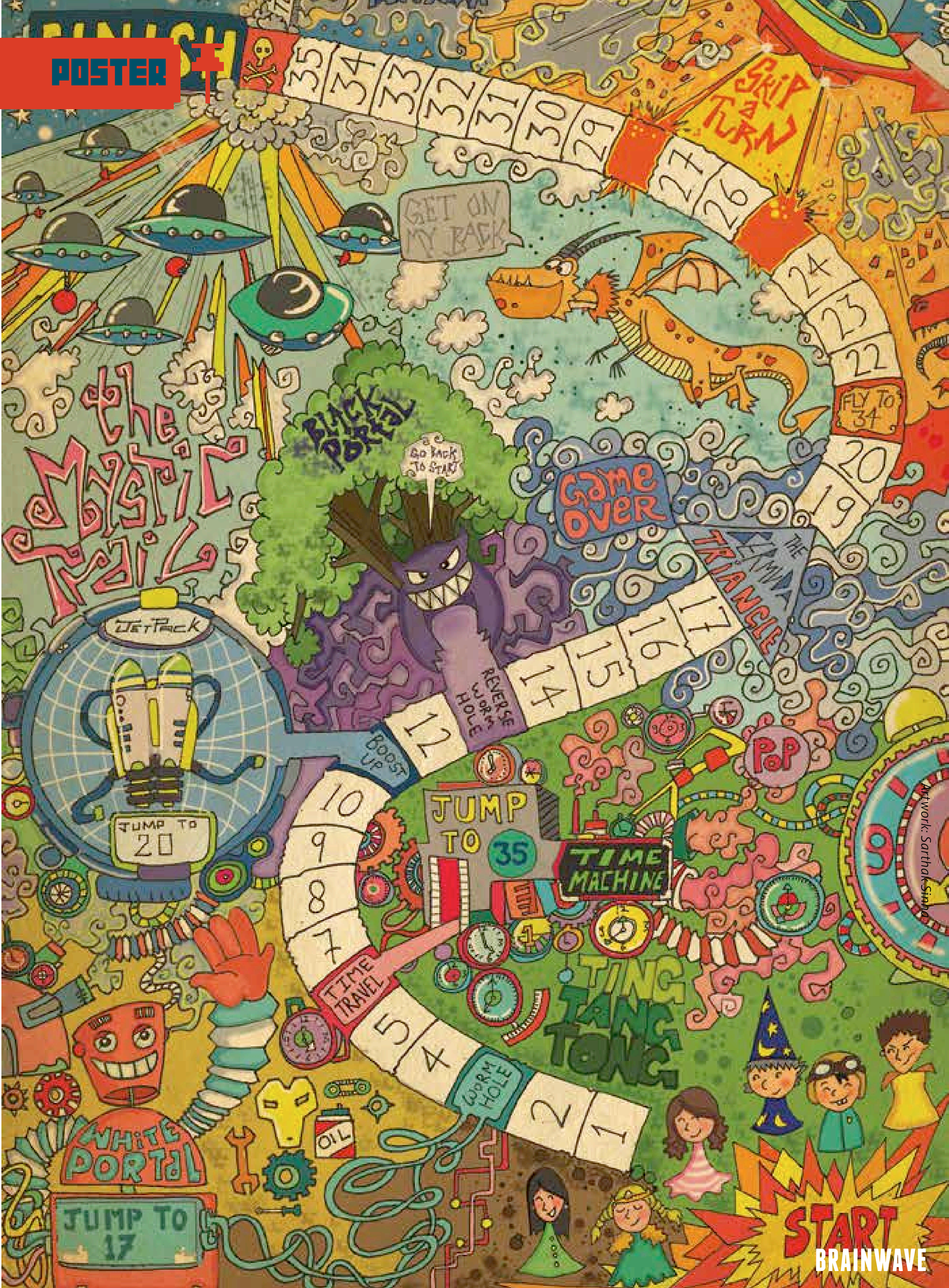
THE SMARTIES

A MAD DISCOVERY

STORY: JAYADEV CALAMUR ART & LETTERING: ABHIJEET KINI


PREVIOUSLY, MR. X ESCAPED, LEAVING BEHIND MISSILE LAUNCHING SUBMARINES OPERATED BY ALIENS.
I NEED TO COMMUNICATE WITH THEM BEFORE THEY CAUSE MORE HARM.
HELLO!
WHO ARE YOU? AND HOW DID YOU GET IN?
I AM BHOO! I TELEPORTED MYSELF INTO THE SUBMARINE. I HAVE COME TO TALK YOU OUT OF DESTROYING THE EARTH AND HUMANITY.
AND YOU THINK WE WILL LISTEN TO YOU?
WOULD YOU NOT? I MEAN NO HARM. I JUST WANT TO TALK.
OH, YOU ARE BHOO! X WARNED US ABOUT YOU.
WARNED?
YES. HE TOLD US THAT YOU WOULD TRY TO DESTROY US WITH YOUR SUPER-POWERS.
UNLIKE X, I DO NOT USE MY POWERS TO HARM ANYONE.
THAT'S FAIR ENOUGH. WE WILL HEAR YOU OUT. GO ON.
OK. WHY DO YOU WANT TO DESTROY THE HUMANS?
THEY HARM THE BALANCE OF THE UNIVERSE. THEY HAVE TO BE STOPPED.
THAT IS NOT THE RIGHT WAY OF LOOKING AT IT.
HOW SO?
HUMANS EVOLVED ONLY 70,000 YEARS AGO. THE UNIVERSE IS 13.8 BILLION YEARS OLD. RELATIVELY SPEAKING, HUMANS ARE JUST BORN BABIES. THEY NEED TO BE NURTURED TO BE AN ASSET TO THE UNIVERSE.
WHAT ARE YOU TRYING TO SAY?
JUST LIKE OUR GUARDIANS DID, WE NEED TO GUIDE THE HUMANS AND TEACH THEM THINGS THE RIGHT WAY. IT IS JUST THAT THEY HAVEN'T YET EVOLVED COMPLETELY AS A CIVILIZATION. DESPITE THAT, THEY HAVE MADE TREMENDOUS PROGRESS. IF WE JOIN HANDS AND HELP THEM, YOU WOULD BE SURPRISED AT HOW FAST THEY CAN LEARN AND GROW!


WE ARE NOW IN TWO MINDS. WHAT DO WE DO?
YOUR CHOICE. YOU ARE AN ADVANCED CIVILIZATION. YOU MUST DO WHAT'S RIGHT, NOT WHAT'S EASY.
YOU ARE RIGHT. YOU MAKE SENSE. WE WILL DISCUSS THIS WITH OUR COUNCIL OF THE WISE RIGHT AWAY.
GREAT. BY THE WAY, HOW DID XAVIER GET IN TOUCH WITH YOU?
HE TRAVELED FROM THE EARTH TO OUR GALAXY AND MET OUR COUNCIL.
THAT'S IMPOSSIBLE FOR A HUMAN!
WELL, HE MANAGED IT. HE DISCOVERED HOW TO USE WORMHOLES FOR INTERGALACTIC TRAVEL. HE ALSO MADE THESE HELMETS, WHICH DECODE ALL ALIEN LANGUAGES AND TEACH THEM TO US IN MINUTES. THAT IS HOW WE ARE ABLE TO SPEAK IN ENGLISH WITH YOU.
I HAVE TO ADMIT. HE IS A GENIUS! HOW I WISH THAT HE HAD PUT IT TO PROPER USE.
YES. HE AND HIS PAL MADHAV ARUN...
M.A.D? WHAT DOES HE HAVE TO DO WITH X?
HE IS MR.X'S RIGHT HAND MAN. HE HAS STEPPED OUT FOR A BIT. HE SHOULD BE BACK ANYTIME.
HMMM! LET'S SPRING HIM A SURPRISE.
JUST THEN...
I AM BACK GUYS!
AND NOW YOU'RE DOWN!
SYDNEY POLICE
BEFORE WE HAND YOU OVER TO THE COPS, WHERE IS XAVIER?
MAKE ME TELL!
TO BE CONTINUED...



Artwork: Sarthak Sinha

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My New Tele-jump-porter!

While Martians are playing football and the Jupes are busy crashing their flying cars on the Earth, young Newty is busy working on a Tele-jump-porter!

by **Allakky Aniket**, Grade 6

It was getting pretty boring in the science class at school. The same concept, friction, was being taught for a week now!

Let me tell you about myself. My dad's a space scientist working on Mars and my mom's an electromechanical expert. I have inherited their genes and a flair for invention. Currently, I am working on a 'Tele-jump-porter'. The best part of the gadget is that it requires no physical engineering! Everything is telepathic.

Back to where we were, it was high time I got away from the boring class, to my invention. I needed to complete it on time for the Galactic Science Fair (GSF). Spotting me not paying attention, the teacher asked, "Newty, tell us about ways to prevent friction." I was so lost in thought that I said, "Ma'am, just reset the file jump/tele/function{port.///plAce.j.pac=01001}/config and voila! The firmware of the Tele-jump-porter is ready." Not until the whole class burst out laughing did I realise what I said. Thankfully, the bell rang and I rushed home to work. The GSF was only 3 days away!

After working for two more nights, my Tele-jump-porter was finally complete. With all the telepathic engineering I did, my head felt heavy and weary. I wanted to take a power nap but was unable to because of the sirens of the police drones whizzing by. Accidents have become a common sight since the Jupes started travelling to the Earth in their flying cars.

With nothing to do but wait for the GSF to start the next day, I decided to try out my invention. I placed the device, which was shaped like a helmet, over my head and commanded 'Barca-Nou Camp'. A soccer match between the Martians and Gladiators was in progress and I was a big fan of the Barca-Gladiators. Whoozz!!! A bright flash and I was amidst thousands of fans in the arena. It was a very exciting match, but a pity that my team lost.

I then decided to go meet my dad on Mars and take his suggestions on how to make my machine better. I put the helmet on and said 'Mars-Ahoy'... The Bright flash did not occur and I did not reach Mars. Confused, I looked around. I was definitely levitating, but moving elsewhere. The helmet gave me a master caution. I tried figuring out what went wrong. I soon realised that Coppery, my arch rival had telepathically tampered with my machine. I was now circling the Earth, unable to escape from its gravitational pull. I couldn't possibly fix the problem while I was stuck in the situation. So I decided to spot my house, take a leap into it, stabilize and fix the issue.

After many revolutions, I managed to spot my house. I closed my eyes and dived. I landed with a big THUD and a blow to my head. Everything became dark...

I woke up, only to realize that I had fallen down from the bed in my sleep. ■

Artwork: Sarthak Sinha

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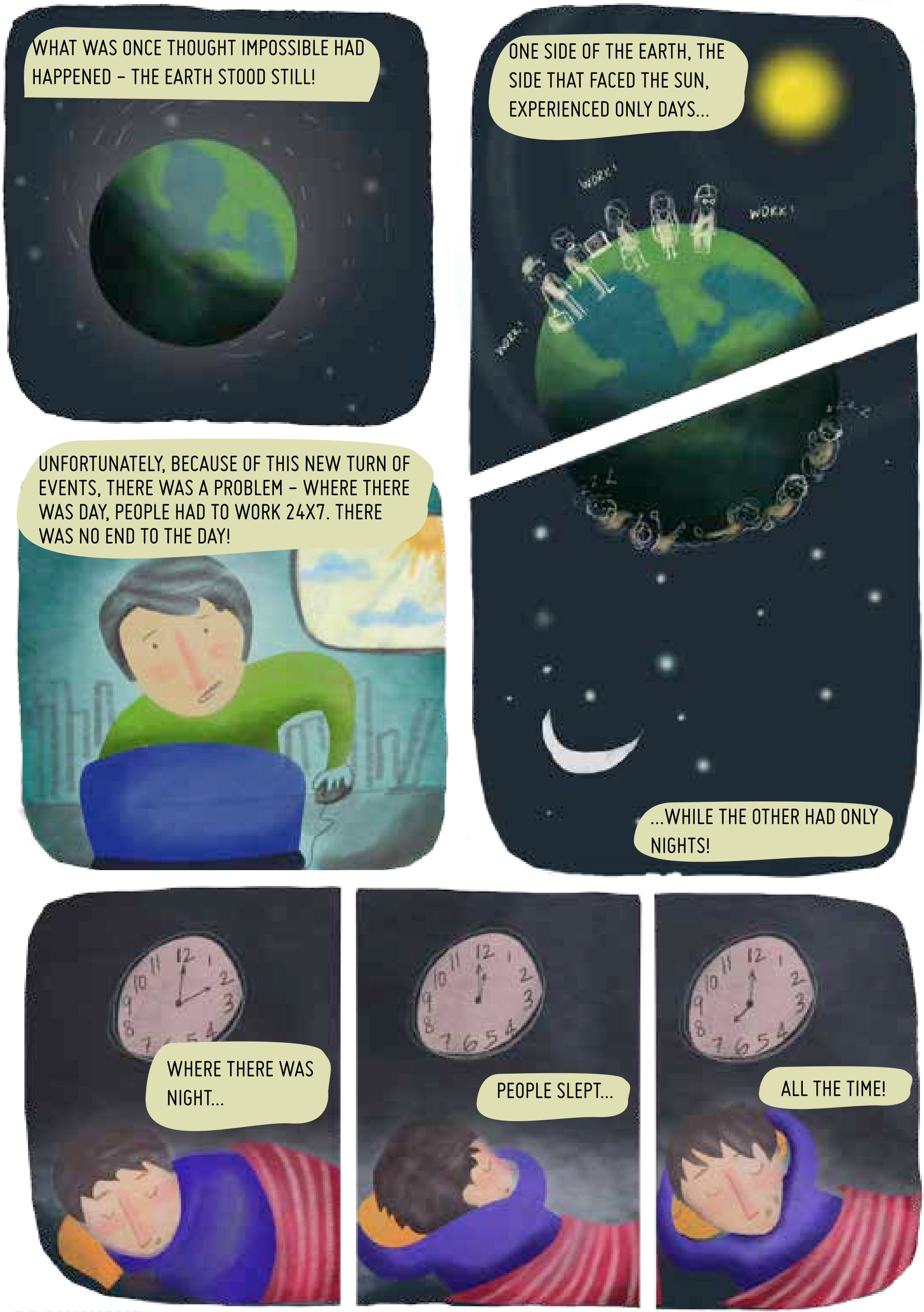
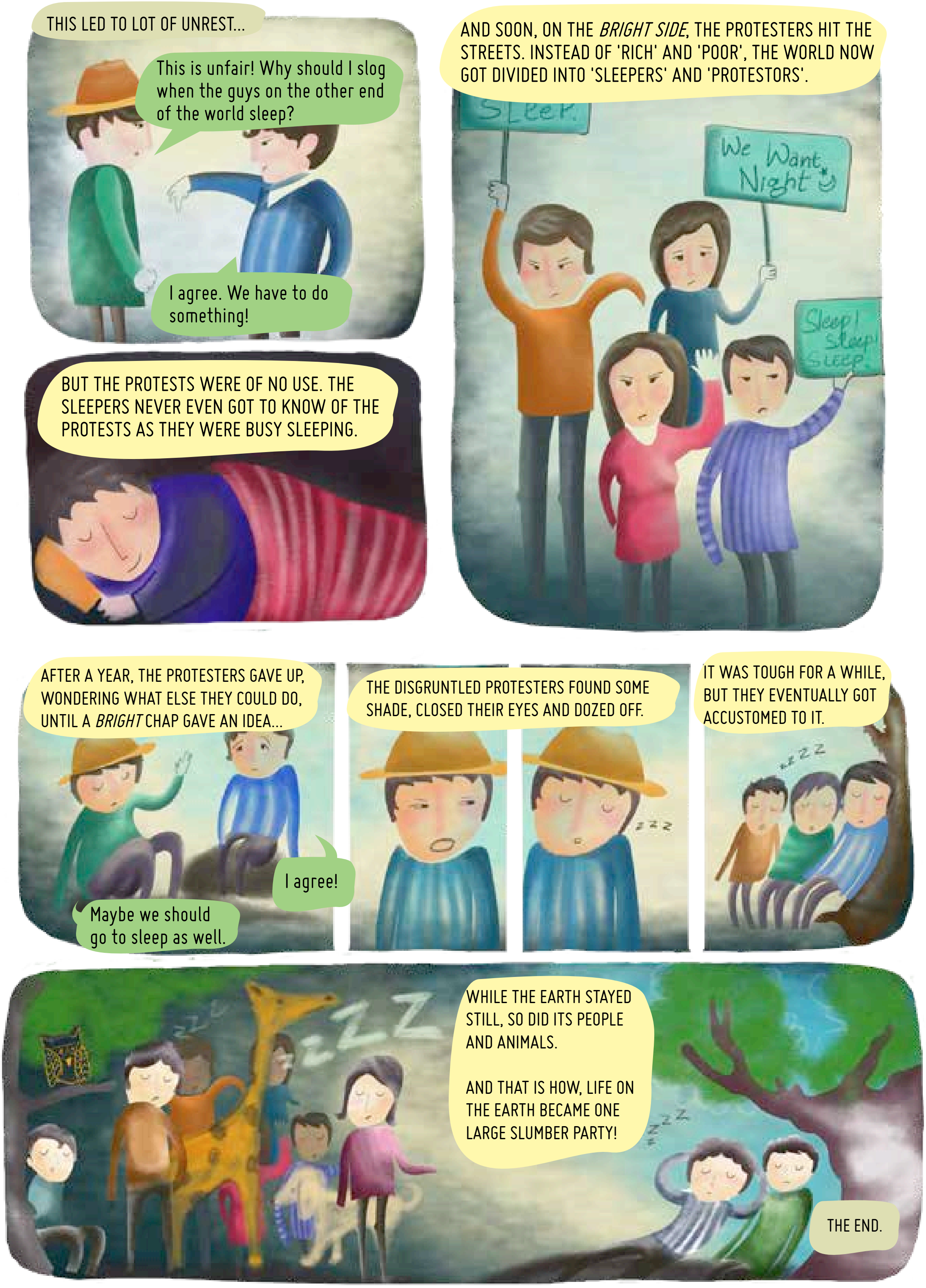
www.bwmag.in/bw-super-science-teacher-awards

Artwork: Kashmira Sarode

FROZEN TIME

STORY BY JAYADEV CALAMUR
ARTWORK BY SAUDAMINI TAMBAY


WHAT WAS ONCE THOUGHT IMPOSSIBLE HAD HAPPENED – THE EARTH STOOD STILL!
ONE SIDE OF THE EARTH, THE SIDE THAT FACED THE SUN, EXPERIENCED ONLY DAYS...
WORK!
WORK!
WORK!
UNFORTUNATELY, BECAUSE OF THIS NEW TURN OF EVENTS, THERE WAS A PROBLEM – WHERE THERE WAS DAY, PEOPLE HAD TO WORK 24X7. THERE WAS NO END TO THE DAY!
...WHILE THE OTHER HAD ONLY NIGHTS!
WHERE THERE WAS NIGHT...
PEOPLE SLEPT...
ALL THE TIME!

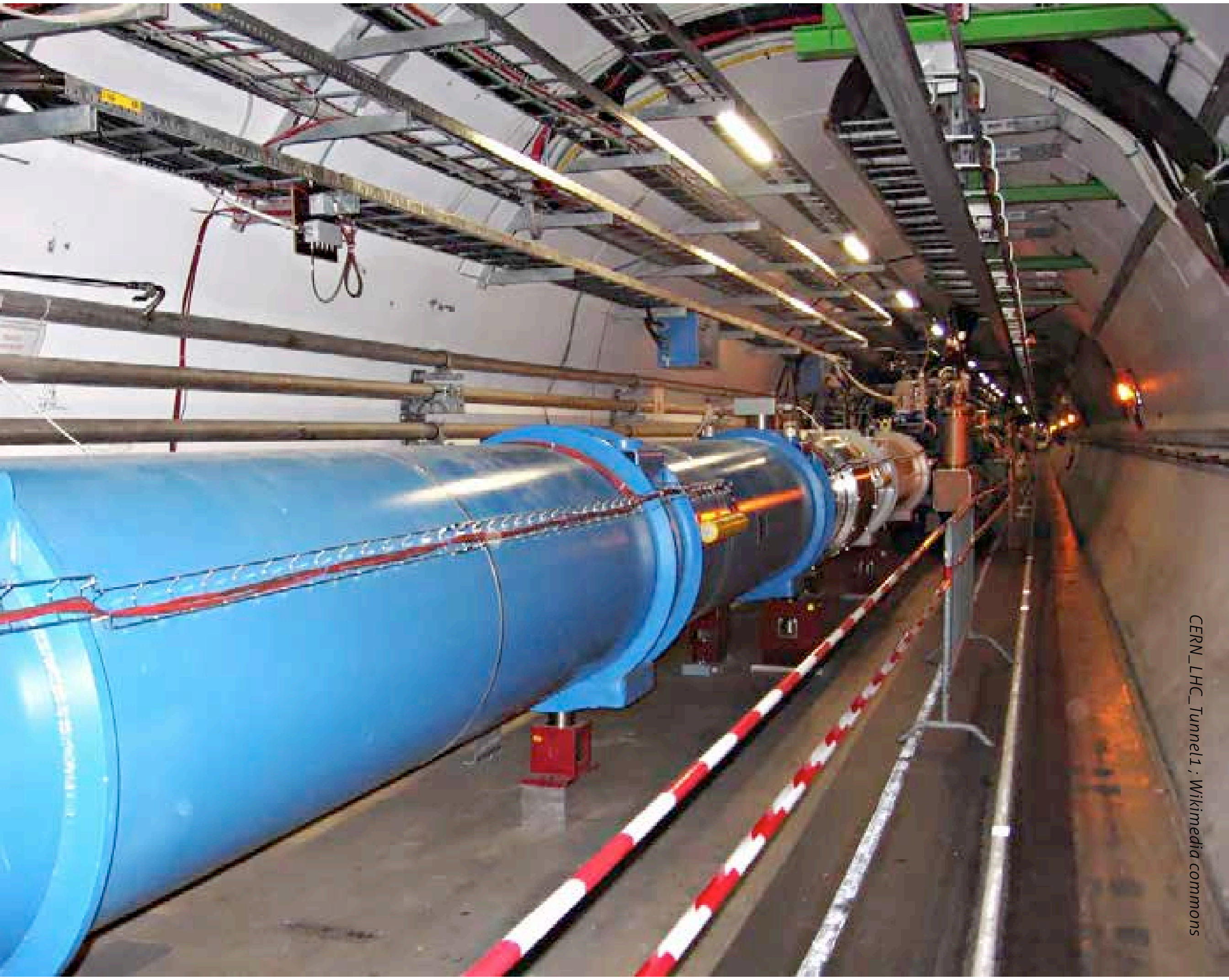

THIS LED TO LOT OF UNREST...
This is unfair! Why should I slog when the guys on the other end of the world sleep?
I agree. We have to do something!
AND SOON, ON THE *BRIGHT SIDE*, THE PROTESTERS HIT THE STREETS. INSTEAD OF 'RICH' AND 'POOR', THE WORLD NOW GOT DIVIDED INTO 'SLEEPERS' AND 'PROTESTORS'.
SLEEP
We Want Night
Sleep! Sleep! Sleep
BUT THE PROTESTS WERE OF NO USE. THE SLEEPERS NEVER EVEN GOT TO KNOW OF THE PROTESTS AS THEY WERE BUSY SLEEPING.
AFTER A YEAR, THE PROTESTERS GAVE UP, WONDERING WHAT ELSE THEY COULD DO, UNTIL A *BRIGHT* CHAP GAVE AN IDEA...
I agree!
Maybe we should go to sleep as well.
THE DISGRUNTLED PROTESTERS FOUND SOME SHADE, CLOSED THEIR EYES AND DOZED OFF.
zzz
IT WAS TOUGH FOR A WHILE, BUT THEY EVENTUALLY GOT ACCUSTOMED TO IT.
zzz
zzZ
WHILE THE EARTH STAYED STILL, SO DID ITS PEOPLE AND ANIMALS.
AND THAT IS HOW, LIFE ON THE EARTH BECAME ONE LARGE SLUMBER PARTY!
zzz
THE END.

A Cern-tific Life

Part 2

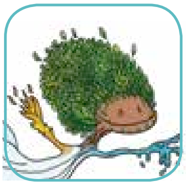
Continuation of the interview with Dr. Jeff Temple, who recently finished his post doctorate research at CERN[G]. Here, he talks about his love for physics, the Big Bang Theory and the television show with the same name.

by **Bhoo**



CERN_LHC_Tunnel1 ; Wikimedia commons

EXCERPTS FROM THE INTERVIEW :

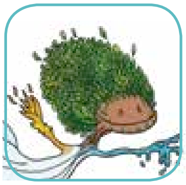


Is there a concrete theory explaining the origin of the universe?

As good as the Standard Model^G is, it is not a complete theory of everything in the universe. For instance, the Standard Model provides no particle that could be a 'dark matter' candidate.

From astronomical observations, we know that the edges of galaxies are rotating faster than expected due to the gravitational pull from all the stars we see in the galaxies. Thus, there must be some other 'dark matter' that adds to the gravitational pull in these galaxies.

If dark matter that rarely interacts with our 'normal' matter except through gravity exists, then it could have been produced easily, immediately after the Big Bang, when temperatures were hot enough for the entire universe to act like a large particle collider^G.



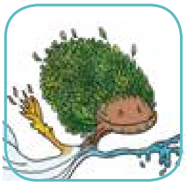
What drove you to study physics?

I doubt that I ever was driven to study physics. I wanted to study physics because of my curiosity and my questions on how things work.

My parents, in a way, have had something to do with my career choice. My mother teaches mathematics and my dad is a veterinarian, so he had expertise in biology and chemistry. This meant that physics was the one area of science that they couldn't help me with. Maybe that drove me to search for answers myself.

Artwork: Saudamini Tambay

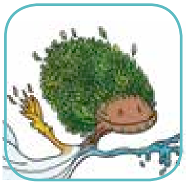
To read and understand more about the Large Hadron Collider^G, visit:
http://lhc-machine-outreach.web.cern.ch/lhc-machine-outreach/introduction.htm
If you have any specific doubts, write to *brainwave@ack-media.com*



How do scientists propose to explain the origin of the universe using the Large Hadron Collider[G]?

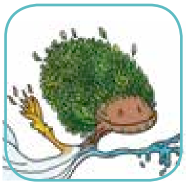
It cannot be claimed that the LHC will explain the origin of the universe, but it will let us produce high energy collisions to effectively look back at the earlier times of the universe.

When the universe was younger, it was smaller, and all of its energy was concentrated in a smaller amount of space. If you could watch the universe age backwards, you would see it get smaller and smaller, and the average energy of the particles in it thus get larger and larger. Higher energy colliders[G] simulate this.



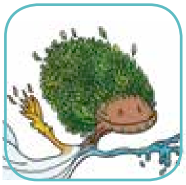
The Big Bang Theory is a popular model to explain the universe's origin. Are there other theories?

There are always other theories. However, the Big Bang theory is universally accepted. Although other theories exist, in order to be taken seriously, they would need to provide explanations like the Big Bang Theory does.



Speaking of the Big Bang Theory, what is your take on the TV show?

I enjoy the show, although I think there are times when it crosses the line between laughing with and laughing at its characters. Its characterization of women was a little troubling to me at first, but they have fixed that by giving Penny more of a personality in the later seasons. I was also glad to see that the show brought in strong female scientist characters through Bernadette and Amy. So, it is not propagating the idea that only boys can be scientists, and is proving that women too fare exceptionally in science.

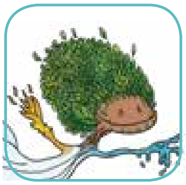


Is there any advice you would give parents and school teachers on how to guide children to be interested in the subject?

I definitely recommend that they take advantage of the web. CERN has a dedicated outreach website: *http://outreach.web.cern.ch/outreach/* and Fermilab has a similar site: *http://ed.fnal.gov/index.shtml?audience=Welcome*

These sites contain lectures and videos for the general public, and also contact information of physicists who would be happy to answer individual questions.

Beyond this, my advice for parents and teachers would be the same - regardless of the student's interest, encourage his or her interest, but also help the student develop a plan for achieving goals. My parents have no background in particle physics and I did not choose it as a specialty until graduate school, but once they knew I was interested in science, they helped me understand what I would need to do to get into a good university.



What is an ideal career path for a school goer who would want to become a scientist and a particle physicist?

First, good grades or at least a demonstrated aptitude for science is necessary at the high school level in order to be accepted into a university that offers a strong science programme.

As an undergraduate college student, you will almost certainly want to major in physics. After getting an undergraduate degree, the next step is graduate school. You generally spend the first one or two years of graduate school taking general physics classes and deciding on your specializations. You then spend 3-4 years or more doing research in your chosen field and produce publishable results that you use for your doctorate thesis.

You can then go on to perform postdoctoral research. At that point, you will be qualified to be a research professor at a university or a research scientist, working full-time at a laboratory. ■

The End

yoo-hoo ALIENS!

To encourage people to contact aliens, a reward called the Guzman Prize was announced in 1900. It awarded 1 Million Francs 'to the person of whatever nation who would find the means with-in the next 10 years of communication with a star and of receiving a response'. This prize was ultimately given to the guys who landed Apollo 11 on the Moon in 1969.

The next time you meet an alien who says "Take me to your king," you need to send them to Dr. Mazlan Othman, the Director of the UN Office for Outer Space. She is rumoured to be THE space ambassador who is supposed to deal with a question like that.

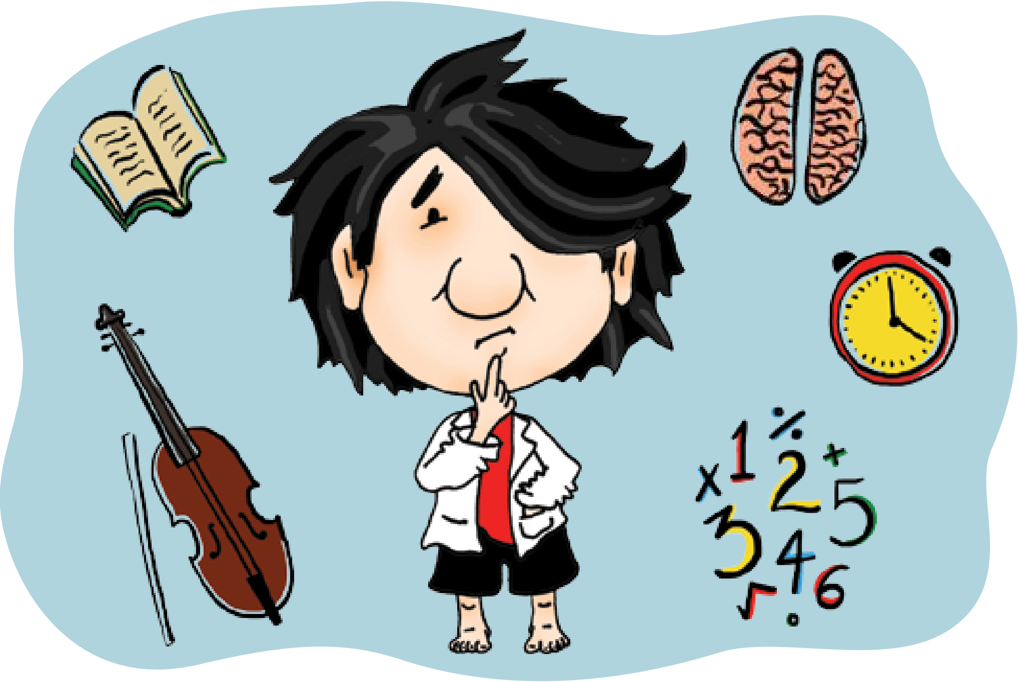
1987.. 1988.. 19.. uhh...
TRING TRING!

The book Bright Star Catalogue lists around 9100 stars. These are supposed to be the maximum number of stars that we can see in the sky from the Earth - from a mountain top, with no Moon in the sky, no lights nearby and clear air.

Artwork: Alicia Souza

Relatively Speaking

by **Alby**



Why is it that time flies when we are playing, but freezes when we have to study?

I do not yet have my own page, but this is pretty nice. While computers interest me, I would rather spend time playing the violin and researching the concept of relativity, which my future self will eventually discover and win a Nobel Prize for!

I have been studying relativity for some time now and I understand that everything in the universe is relative. There is nothing that is absolute, other than the speed of light. It is all in the mind of the observer.

Nevertheless, I have a burning question. Why is it that time zaps so fast when I play the violin, but is frozen when Dr. Dodo and Skree! ask me to work out to keep myself fit? Five minutes feel like five centuries!

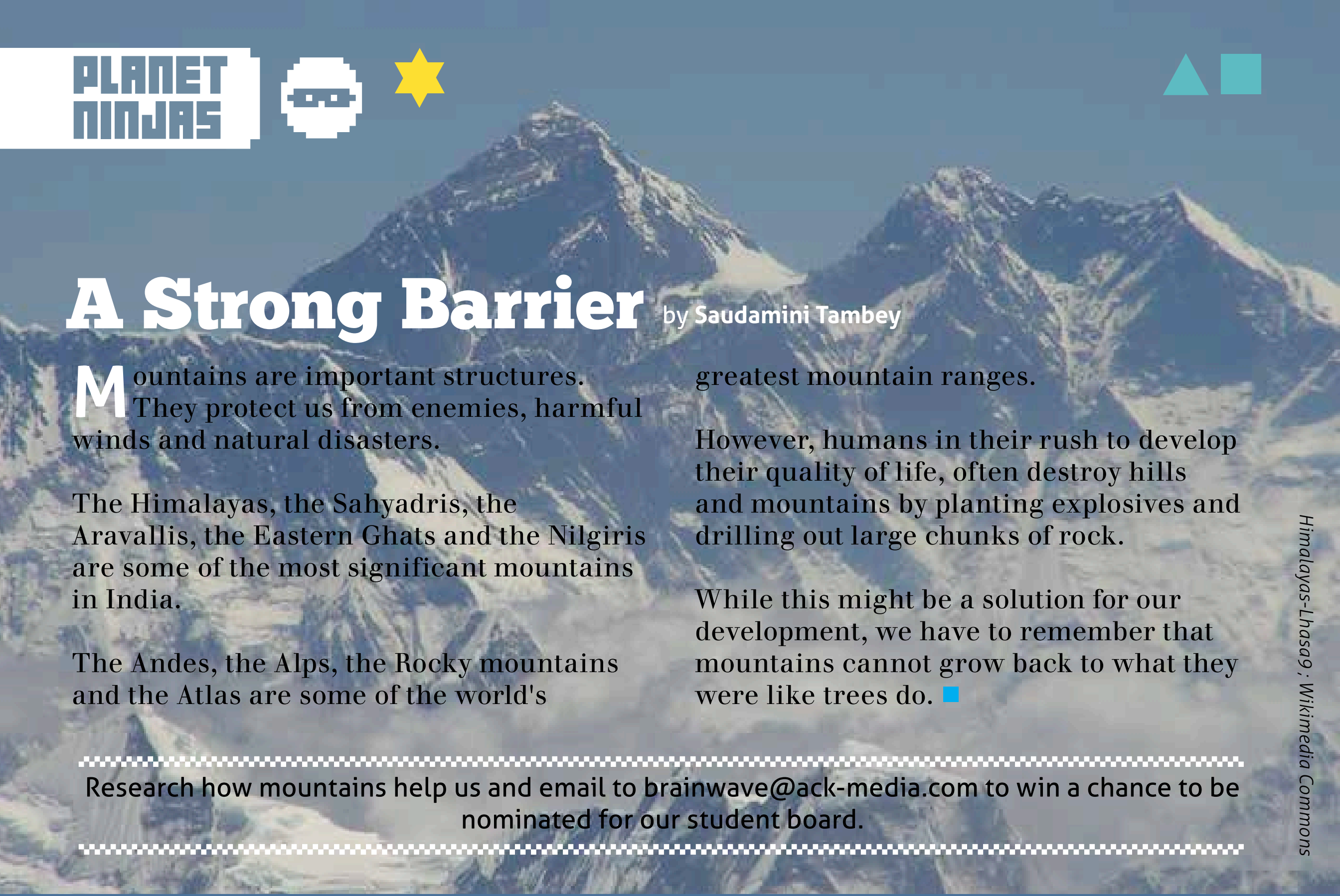
I have been reading about this for a while now. What I found out is pretty interesting. Studies suggest that the brain has different neural circuits, each with their own timing mechanisms for specific activity. Clever, very clever! This means the possibility of artificially manipulating time perceptions is real. This also explains why our sense of time is different under different conditions.

Apparently, the brain acts in a very interesting way in people who have a fear of mathematics. The areas of the brain that are responsible for physical pain are activated when these people are forced to study maths, resulting in headaches and other detrimental side effects!

Personally, I find the idea of being afraid of maths ridiculous, but then I'm Alby. I have an excuse to like it. ■

Artwork: Vinayak Varma & Kashmira Sarode

PLANET NINJAS



Himalayas-Lhasa9; Wikimedia Commons

A Strong Barrier

by **Saudamini Tambey**

Mountains are important structures. They protect us from enemies, harmful winds and natural disasters.

The Himalayas, the Sahyadris, the Aravallis, the Eastern Ghats and the Nilgiris are some of the most significant mountains in India.

The Andes, the Alps, the Rocky mountains and the Atlas are some of the world's greatest mountain ranges.

However, humans in their rush to develop their quality of life, often destroy hills and mountains by planting explosives and drilling out large chunks of rock.

While this might be a solution for our development, we have to remember that mountains cannot grow back to what they were like trees do. ■

Research how mountains help us and email to brainwave@ack-media.com to win a chance to be nominated for our student board.

MAGIC SCIENCE

A Number Trick!

by **Kayomarz Bacha**

Here is a simple trick to demonstrate to your friends and family that you can read their mind. All you need is a little concentration.

Step 1: Ask your friend to pick a number between 1 and 10. They must not tell you what it is.

Step 2: Let them multiply that number by 2.

Step 3: They should add 10 to the resultant number.

Step 4: Ask them to divide this number by 2.

Step 5: Finally, from this number, have them subtract the original number.

Declare to them that the final number is 5 and smile. Cool and simple, right?

This is how this works: The trick is in step 3. If you notice, in step 3, you add 10 and your answer is 5. The final number will always be half of what you add in this step. Just ensure that the number you add is always even.

If you want to challenge yourself, ask your friends to start with any number between 1 and 100. Just make sure that you practise enough to calculate correctly. All the best!

Try it out and let us know how your friends and family reacted. ■

ARE COCKROACHES THE BEST SURVIVORS?

by **Sasikanth C**

Bush_Cockroach ; Wikimedia Commons

Cockroaches can live upto a month without a head, agreed. Now, meet the water bears. They can go without food or water for even ten years!

It is said that cockroaches can survive a nuclear holocaust. This fact surfaced when it was found out that the 300 million-year-old insects were the only survivors after the United States dropped atomic bombs on Hiroshima and Nagasaki in 1945.

To test this scenario, researchers subjected cockroaches to different levels of radiation - 1000 rads[G] (that could kill a human in 10 minutes), 10,000 rads and 100,000 rads. After a month, half the roaches exposed to 1000 rads and a remarkable 10% of the ones exposed to 10,000 rads were still alive! None of the ones subjected to 100,000 rads made it through, confirming that cockroaches can survive a nuclear explosion, but only to a point.

So, are there any other creatures on Earth that could survive high radiations, pressures, temperatures, and starvation? A cockroach, for instance, would survive even when its head is chopped off, but would eventually die of starvation.

Meet the water bears. They aren't actually bears. They are tiny, 1 millimeter long creatures with a barrel like body. They have eight legs and instead of a face, have a suction mechanism much like the creatures we see in science fiction movies. The name 'water bear' comes from the way they walk, slowly, just like a bear.

These creatures can survive extreme temperatures, from -273 degrees Celsius to 151 degrees! They can survive pressures greater than any found in the deepest ocean trenches and can live through the vacuum of outer space. They can survive all kinds of radiation, doses of which are hundred times higher than what would kill a person. They can go without food or water for nearly ten years.

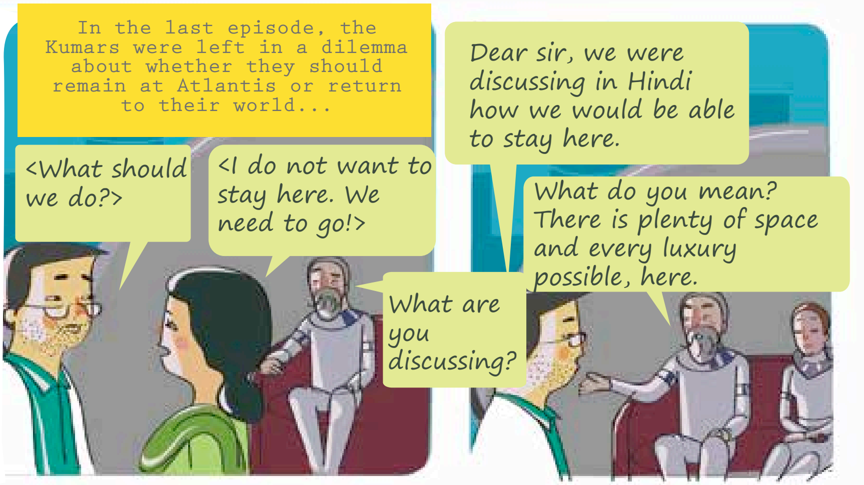
About 1150 species of water bears have been described so far. They occur throughout the world, from the Himalayas to the deep sea and from the polar regions to the equator.

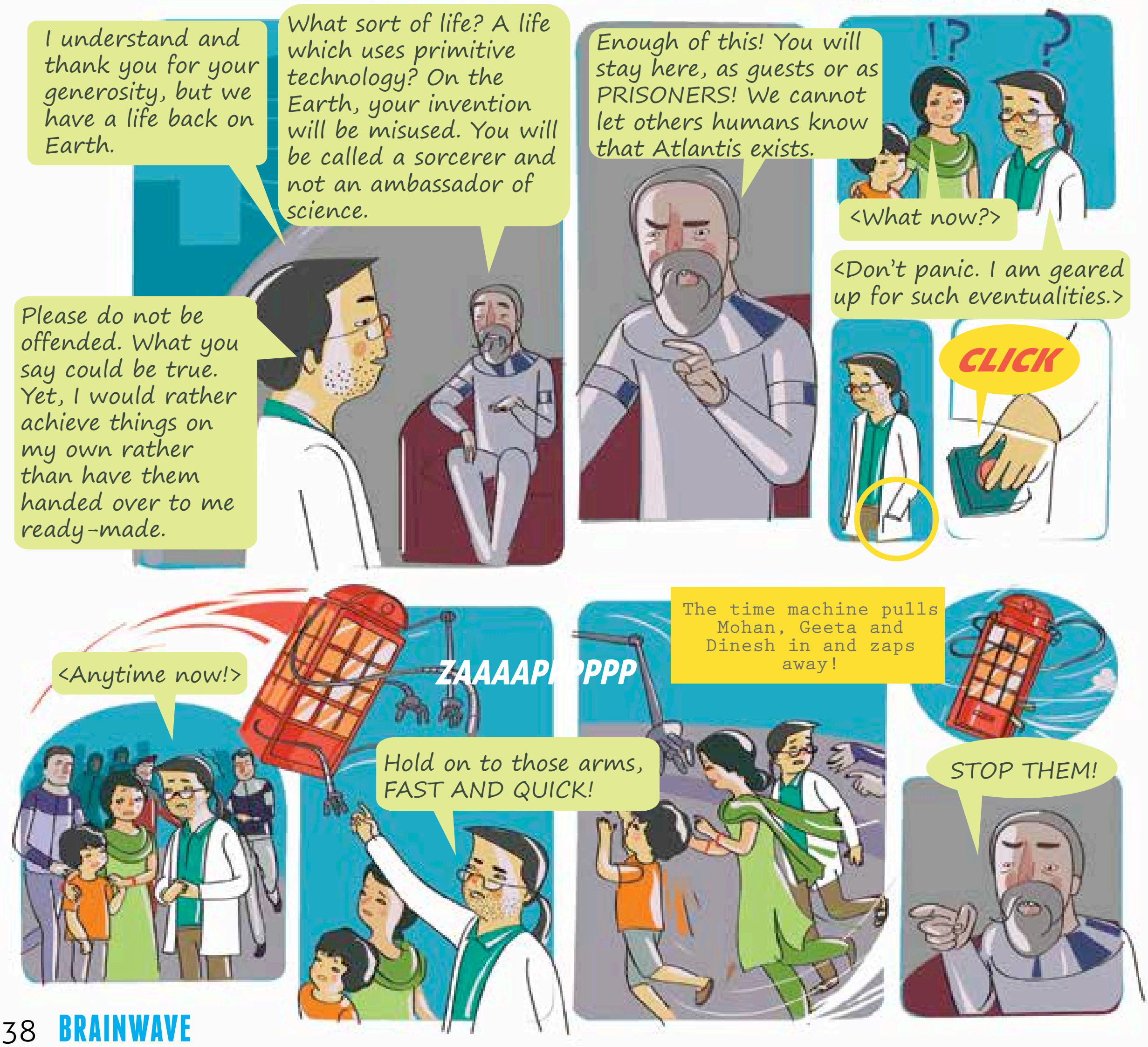
Think about it - for the water bear that is accustomed to living in extreme conditions, the human body, which is a host for many microorganisms, would seem like a vacation!

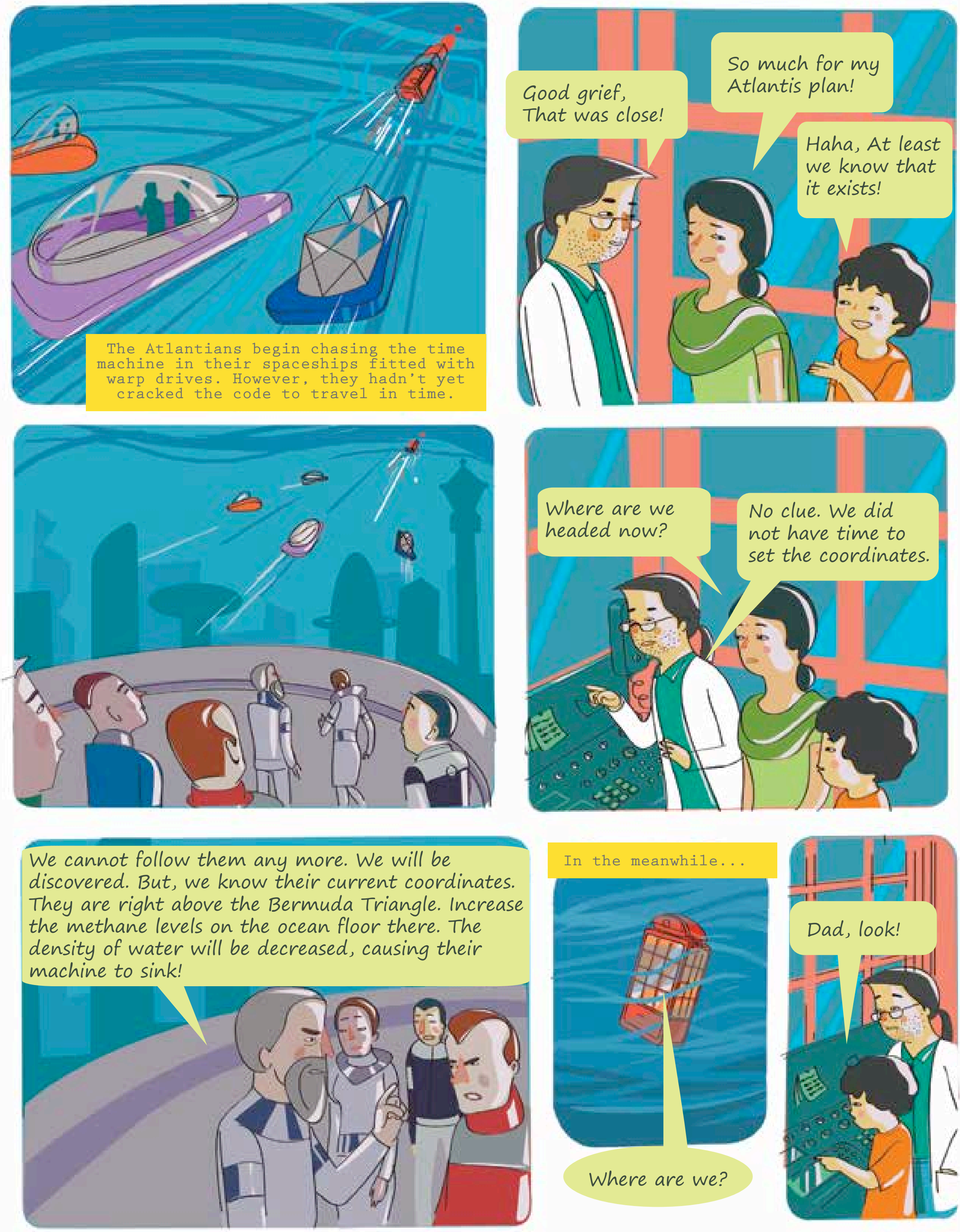
THE TIME TRAVELLING KUMARS

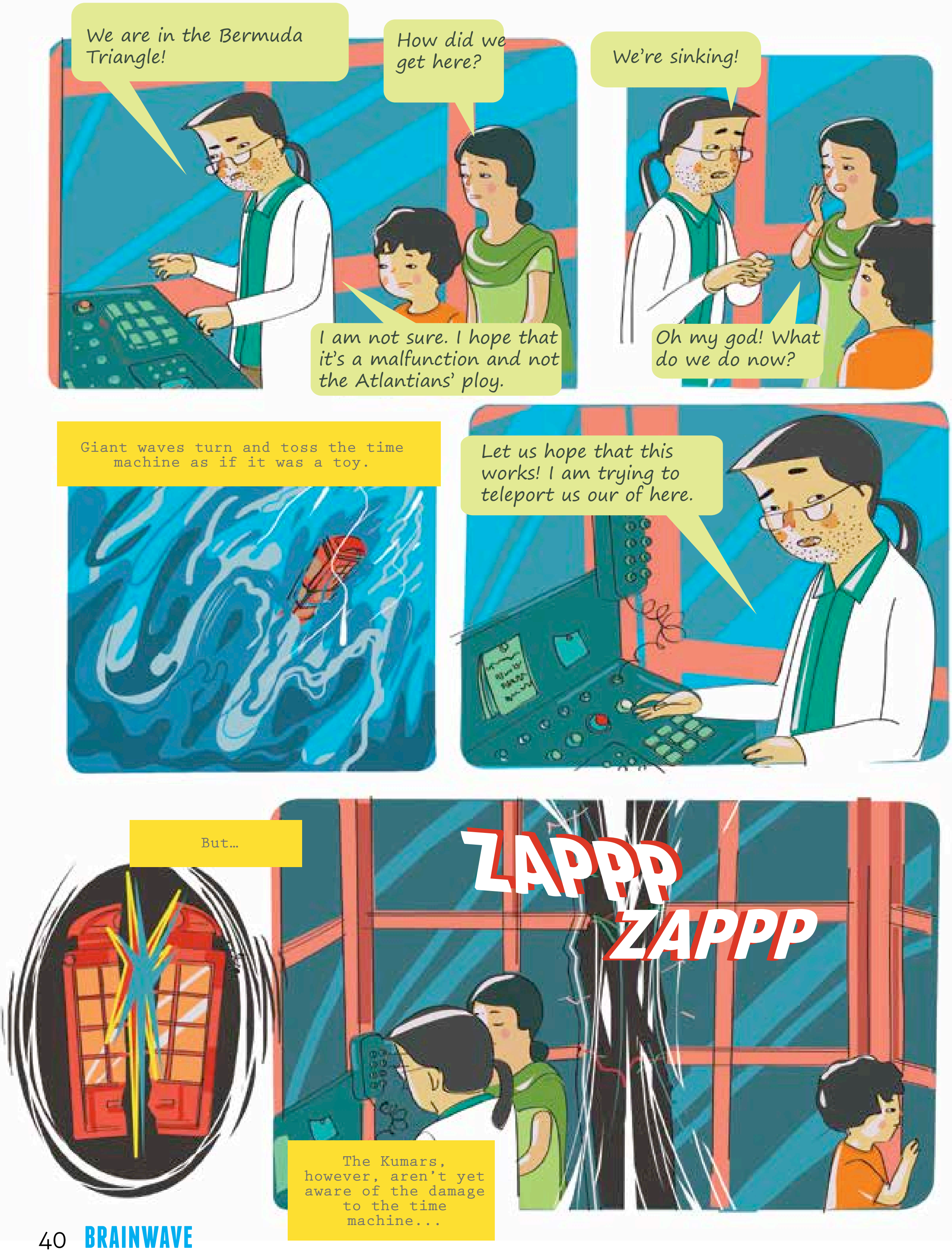
Episode 6

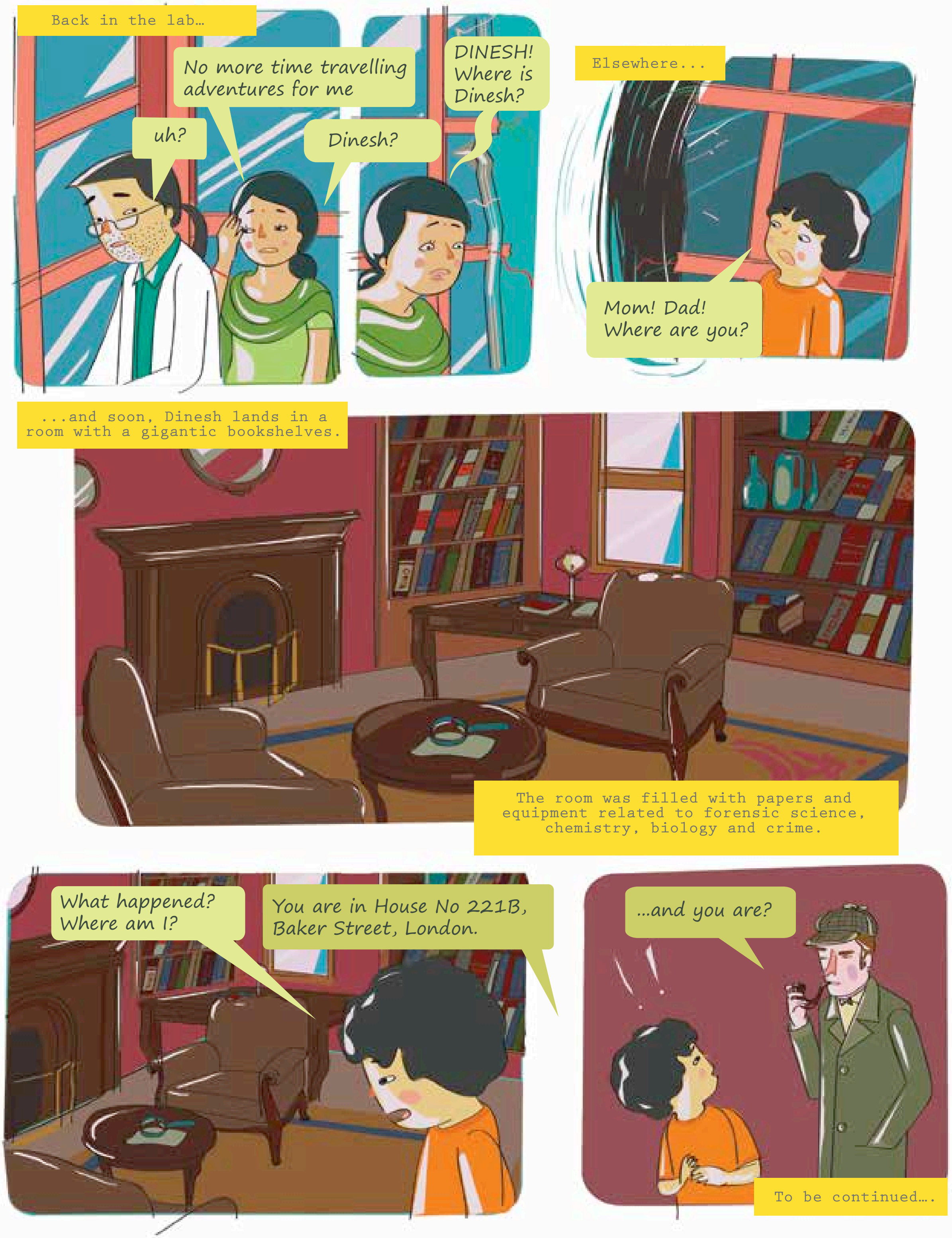
Story by Jayadev Calamur
Artwork by Devashree Dhakras


In the last episode, the Kumars were left in a dilemma about whether they should remain at Atlantis or return to their world...
<What should we do?>
<I do not want to stay here. We need to go!>
What are you discussing?
Dear sir, we were discussing in Hindi how we would be able to stay here.
What do you mean? There is plenty of space and every luxury possible, here.


I understand and thank you for your generosity, but we have a life back on Earth.
What sort of life? A life which uses primitive technology? On the Earth, your invention will be misused. You will be called a sorcerer and not an ambassador of science.
Please do not be offended. What you say could be true. Yet, I would rather achieve things on my own rather than have them handed over to me ready-made.
Enough of this! You will stay here, as guests or as PRISONERS! We cannot let others humans know that Atlantis exists.
!?
?
<What now?>
<Don't panic. I am geared up for such eventualities.>
CLICK
<Anytime now!>
ZAAAAPPPPP
Hold on to those arms, FAST AND QUICK!
The time machine pulls Mohan, Geeta and Dinesh in and zaps away!
STOP THEM!


The Atlantians begin chasing the time machine in their spaceships fitted with warp drives. However, they hadn't yet cracked the code to travel in time.
Good grief, That was close!
So much for my Atlantis plan!
Haha, At least we know that it exists!
Where are we headed now?
No clue. We did not have time to set the coordinates.
We cannot follow them any more. We will be discovered. But, we know their current coordinates. They are right above the Bermuda Triangle. Increase the methane levels on the ocean floor there. The density of water will be decreased, causing their machine to sink!
In the meanwhile...
Where are we?
Dad, look!


We are in the Bermuda Triangle!
How did we get here?
I am not sure. I hope that it's a malfunction and not the Atlantians' ploy.
We're sinking!
Oh my god! What do we do now?
Giant waves turn and toss the time machine as if it was a toy.
Let us hope that this works! I am trying to teleport us our of here.
But…
ZAPPP
ZAPPP
The Kumars, however, aren't yet aware of the damage to the time machine...


Back in the lab...
No more time travelling adventures for me
uh?
Dinesh?
DINESH! Where is Dinesh?
Elsewhere...
Mom! Dad! Where are you?
...and soon, Dinesh lands in a room with a gigantic bookshelves.
The room was filled with papers and equipment related to forensic science, chemistry, biology and crime.
What happened? Where am I?
You are in House No 221B, Baker Street, London.
...and you are?
To be continued....

The Maths of Being a Celeb

by **Kashmira Sarode**

Amisha's Economic Policy

Bollywood actress Amisha Patel may not be the biggest name in the industry. But when it comes to academics, she shines like a star. She holds a gold medal in economics from the Tufts University in Medford, Massachusetts.

Given that economics has a lot to do with mathematics, we must admit that she is really sharp. She was even offered a job at Morgan Stanley as an analyst, but turned it down. She returned to India, took up theatre and entered Bollywood. ■

The Action Hero Business

There is more to Arnold Schwarzenegger than his role as the *Cybernetic Model* in the science fiction movie, *The Terminator*. Arnie is not only a multiple winner of the bodybuilding competition *Mr. Universe*, but also holds a degree in business.

He has been a successful businessman, even partnering with friends Sylvester Stallone and Bruce Willis to start Planet Hollywood, a chain of restaurants.

His business acumen got him to draft several policies and be elected as the governor of California for two terms! ■

April Fool Anyone?

In 2012, Sir Richard Branson launched a website called www.virginvolcanic.com where he spoke of building a machine that would take enthusiasts on a journey to the centre of the world through a volcanic crater. The website also said that Branson would be accompanied by Hollywood star Tom Hanks.

Unfortunately, it turned out to be an April Fool's joke. Hopefully, in a few hundred years, humans would actually find a way to withstand the scalding temperatures of 1000 degree Celsius in a volcano and journey to the centre of the Earth! ■

Artwork: Kashmira Sarode

Dream On!

by **Jayadev Calamur**

Wouldn't it be great if we could record and interpret dreams? The idea may soon be a reality, thanks to the dream machine!

Everyone dreams. Humans dream, dogs dream and even rats dream. Animal dreams seem to replay events that occurred while they were awake.

Humans mumble or scream during a dream, depending on whether it is a pleasant dream or a nightmare. Some people wake up and pen down their dreams so that they remember them. Apparently, Abraham Lincoln ascribed powerful meanings to his dreams. He had even dreamt of his assassination days before!

One of India's greatest mathematical geniuses, Srinivasa Ramanujan said that the inspiration and insight for his work came to him in his dreams.

Dream interpretation has been around for years. If you look up the internet, there are several websites that 'help' you interpret your dreams and 'unify your body, mind and spirit'.

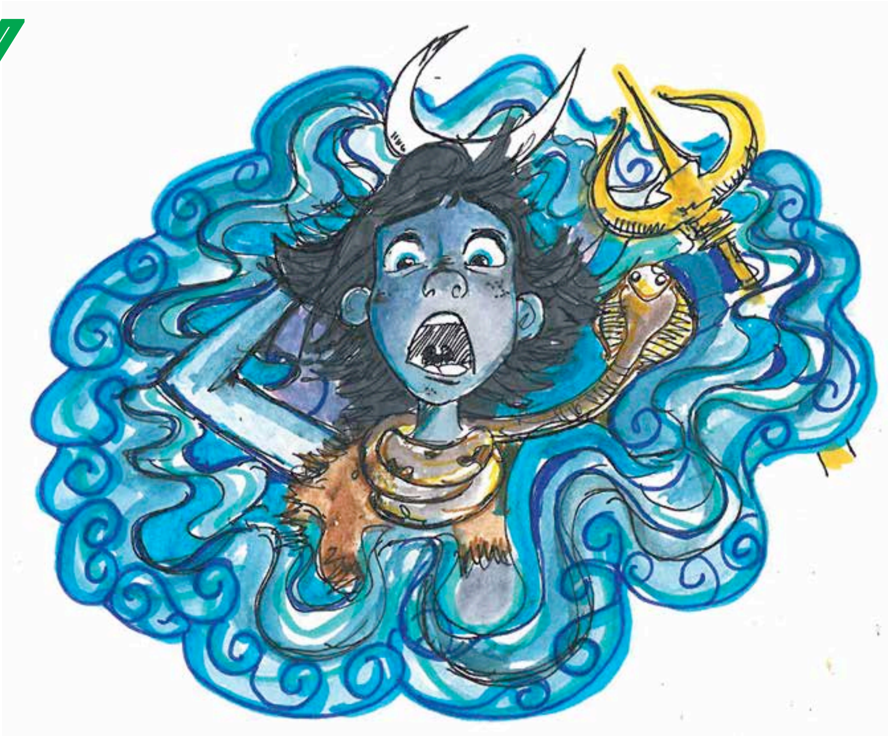
Now, researchers at the University of California have developed a computerized mind-reading technique, which maps the distinct electrical patterns of the brain and translates them into words.

This study raises the possibility of the dumb communicating through the power of thought, judges finding out if criminals are telling the truth, and 'reading' and recording dreams.

It sounds quite similar to downloading a file from a computer hard disk or to Professor Dumbledore taking out memories from his head and emptying them into a pensieve, doesn't it? ■

Artwork: Saudamini Tambay

OH MY GOD!



While the topic of God is subjective, with some believing and others not, it is a topic that can't be ignored.

by **Arby**

We begin our day at school with a morning prayer. Regularly, we ask God to look after us, to ensure that our day goes well and that we do not encounter any trouble.

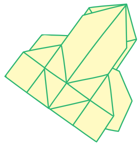
As we grow older, we begin interpreting God in different ways. Some of us believe passionately and impose our views on others, some may not believe at all, while others believe that God and prayer are personal things.

There are other interesting things that a number of us follow. Horoscope, through which one can determine the personalities of individuals based on the date of their birth is one. Astrology, which predicts the future based on date, time and location of birth, and the planetary positions at the time of birth is another. Some cultures follow the solar calendar, while others follow the lunar one. There are also debates about which calendar is better and more accurate.

While astrology is the science based on the positions of stars and planets, numerology is the science of names and numbers. There are people who swear by numerology, while others think that it is not scientific.

The debate on the science behind these beliefs will be a never ending one. ■

Artwork: Sarthak Sinha

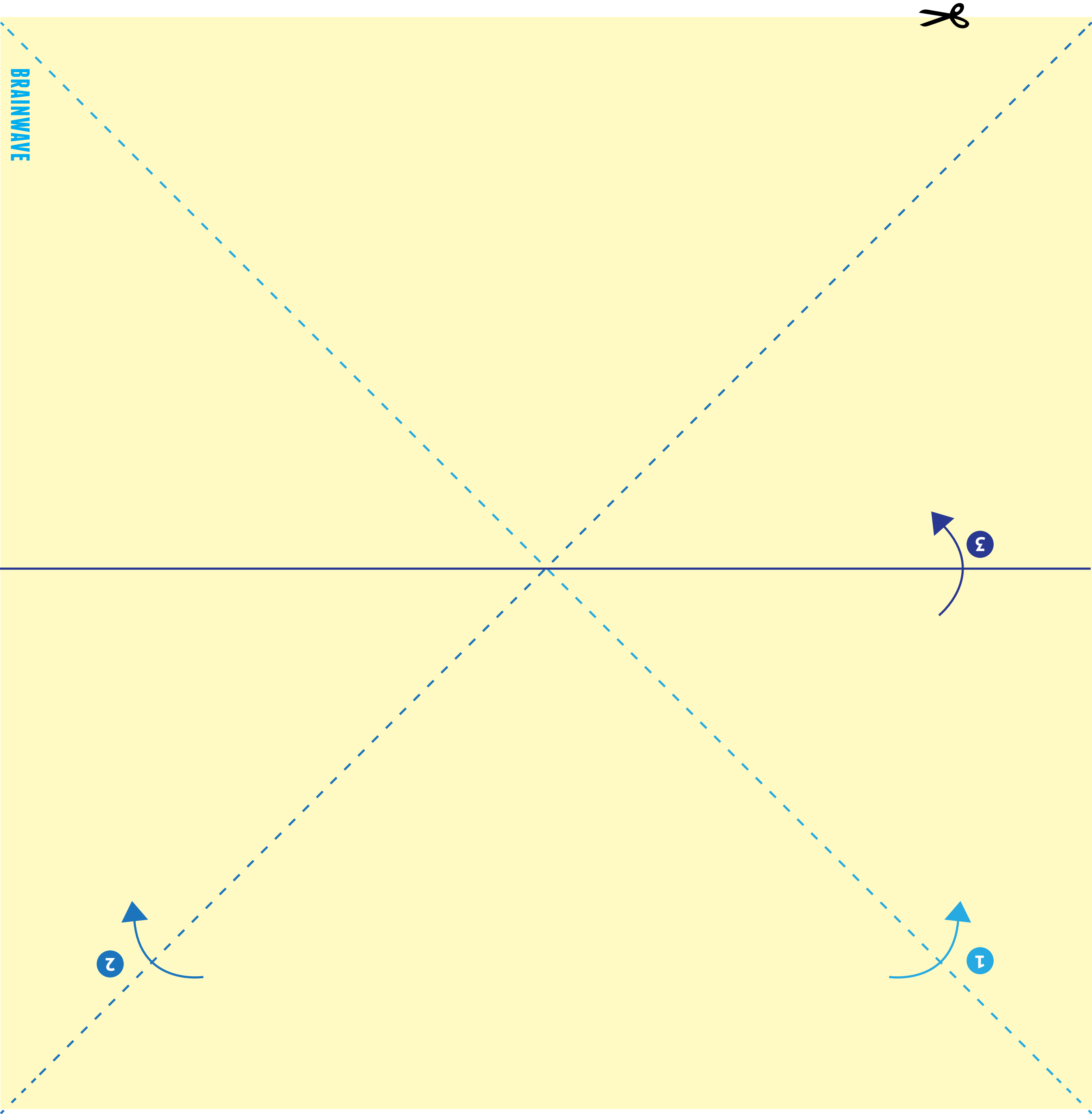


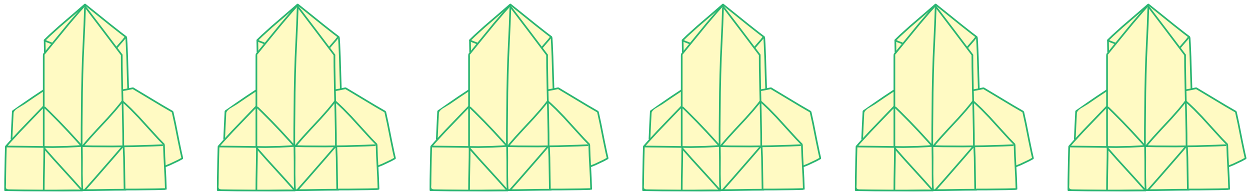
Origami Spaceship

DO IT YOURSELF

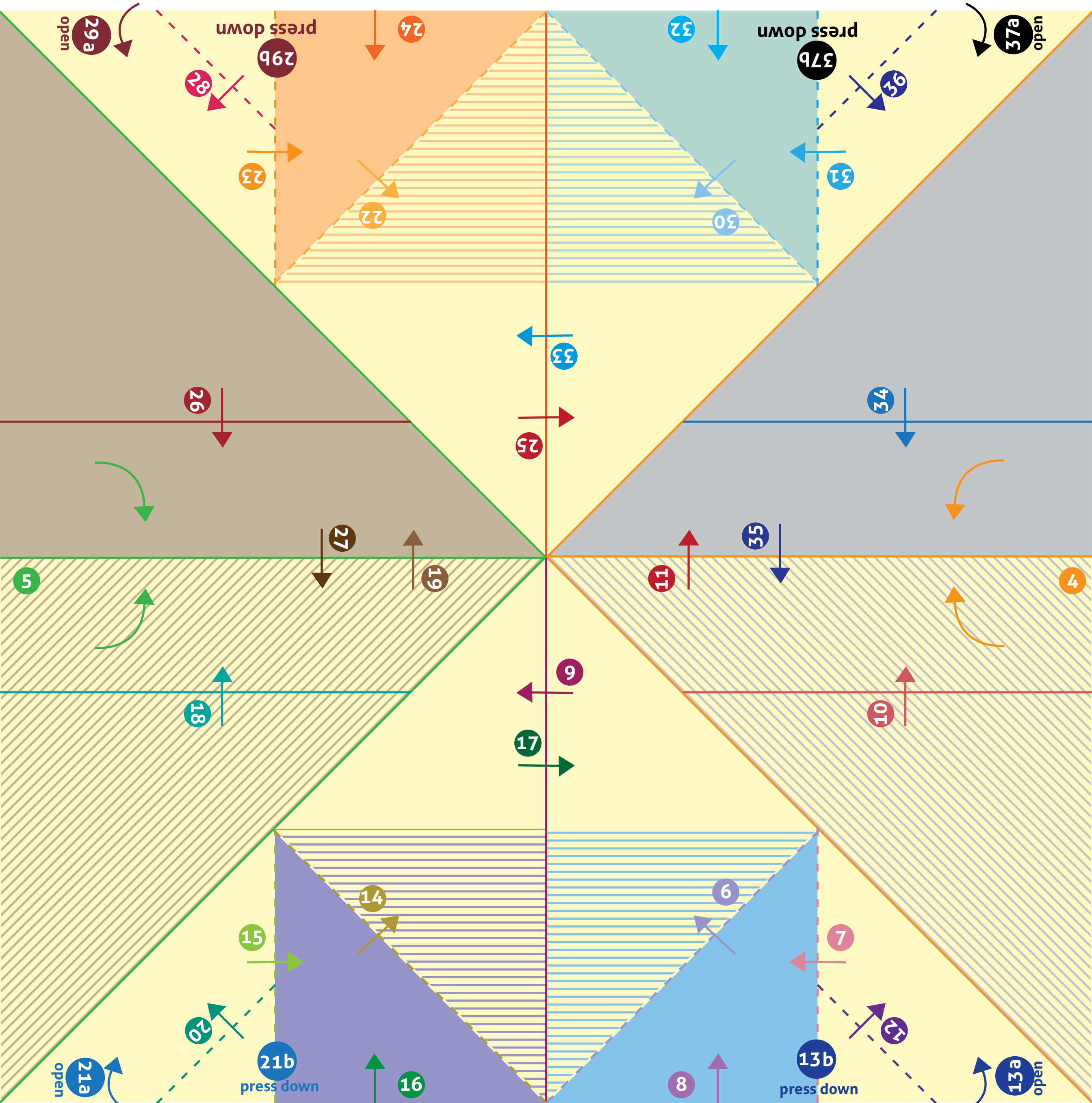
Instructions for folding:

1. - - - - - - - - - - - Crease (fold and open) along the line
2. ———————— Fold along the line
3. ■ ☰ Fold such that, the solid colour block covers the lined block.





Watch the video for guidance at: *www.youtube.com/watch?v=zhj2d99RV9Q*



SCIENCE GLOSSARY

p07

Refraction of Light: Light rays, when they pass from one medium to another (for example, from air to water) at any angle other than 90 and 0 degrees, change direction. This phenomenon is called refraction.

p12

Stem Cells: Stem cells are biological cells found in all multicellular organisms. They have the potential to become any type of cell (blood, heart, bones, skin, muscles, brain etc.) in the body. They also self-renew or multiply.

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Particle Physics: Particle physics is the branch of physics that studies the nature of particles that make up matter. This enables a better understanding of the universe, leading to the development of various technologies like the World Wide Web, treatment of cancer, superconducting of wires and cables etc.

Neutrinos: Neutrinos are one of the fundamental particles which make up the universe. They are also one of the least understood and are similar to the more familiar electron, with one crucial difference - neutrinos do not carry electric charge.

p30, 31 & 32

CERN: CERN is the European Organization for Nuclear Research. It operates the world's largest particle physics laboratory.

Large Hadron Collider: LHC is the world's largest and most powerful particle collider. It consists of a 27-kilometre ring of superconducting magnets with a number of accelerating structures to boost the energy of the particles along the way.

Particle / Energy Collider: When the universe was younger, it was smaller and all of its energy was concentrated in a small amount of space. The average energy of the particles in it was very large. Particle colliders simulate this to enable the study of the universe better.

The Standard Model: Everything in the universe is made from a few fundamental particles, governed by four fundamental forces. The Standard Model explains our best understanding of how these particles and forces are related to each other.

p37

Rads: Rad is the unit of measurement for absorbed radiation dose.

Sci-Q Time!

Finished reading the magazine? Answer these simple questions to win a mystery gift worth Rs. 500:

1. What are particle accelerators?
2. What is alchemy?
3. What is a warp drive?
4. What is the speed of sound in dry air, at 20 degrees Celsius?
5. Where are the Alps located?

To take part in some cool science initiatives, visit ***www.bwmag.in***

Parents and teachers, here's something unique for you:
www.bwmag.in/parent-teacher-expert-collaboration

Readers, get to see behind the scenes:
www.facebook.com/brainwavemag

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Brainwave is a children's science magazine from the house of Amar Chitra Katha and Tinkle.

We understand that each child has a different aptitude and love for science. Hence, we simplify science into forms that excite them - comics, stories, fun-do activities, contests and fascinating facts.

Give your child a Brainwave, and science will be just another game!